THE SAILING FRIGATE

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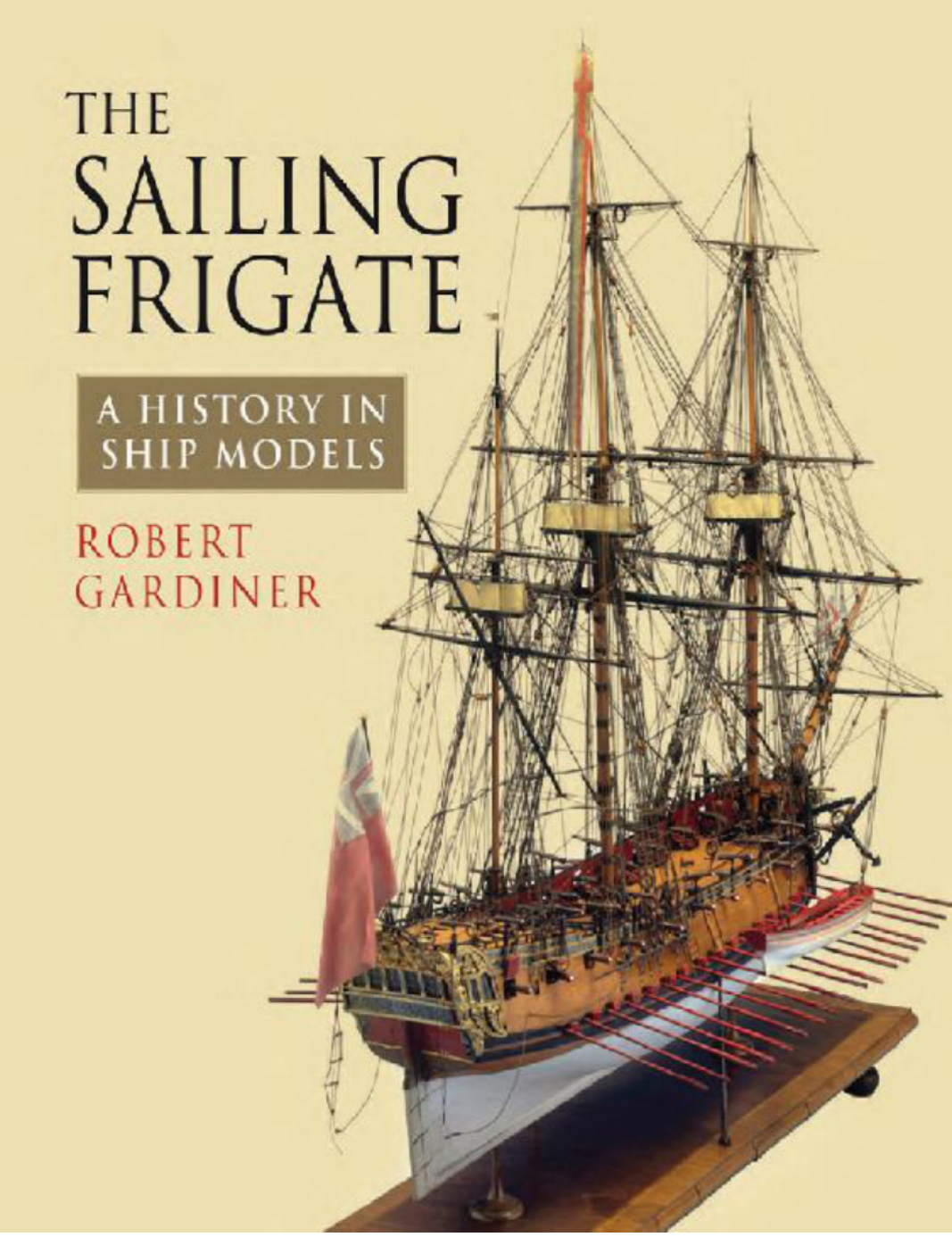
A HISTORY IN SHIP MODELS

ROBERT GARDINER



THE SAILING FRIGATE

SRL0004 Half title: Bow of the *Mordaunt*, an ex-privateer bought into the Navy in 1683; typical of the small two-deckers that carried out cruiser duties in the Restoration period.

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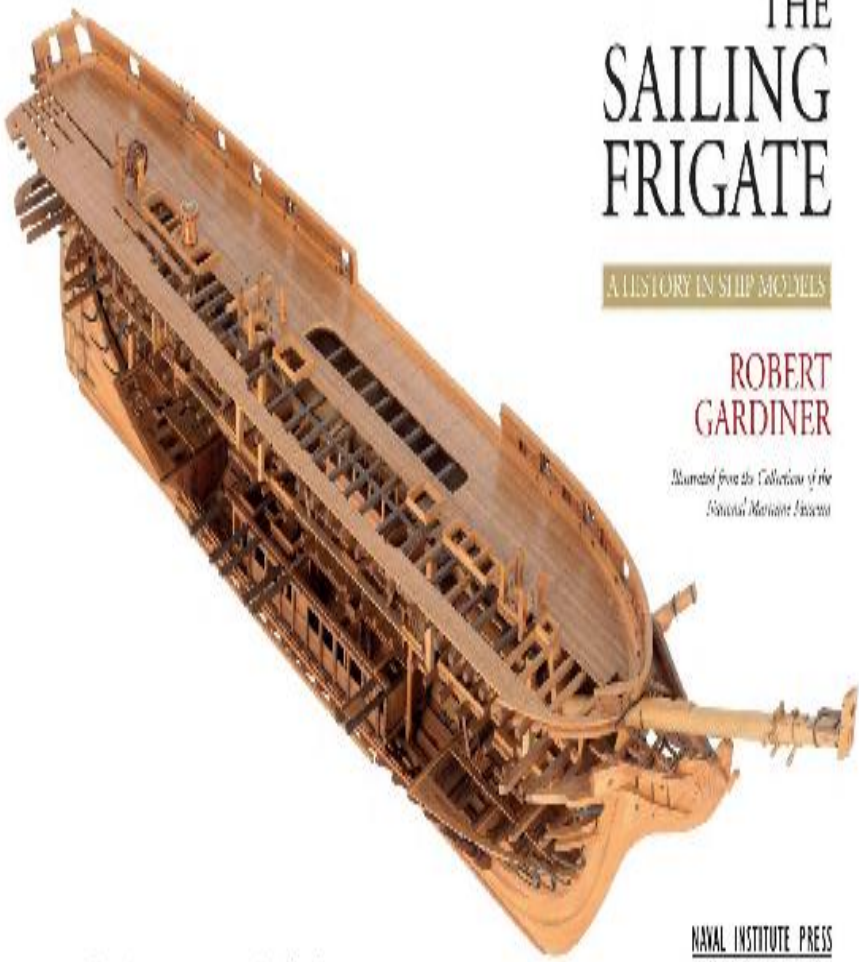
Illustrated from the Collection of the National Maritime Museum



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Frontispiece: A stern-view model of the frigate *Pique* of 1834. See pages 120-121.

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Finally, we must thank Major Grant Walker for permission to reproduce photographs of models in the US Naval Academy Museum that have no parallel in any other collection.

References

Footnotes have been avoided in this book, but for readers interested in pursuing the subject in more detail, there is a file of additional information, sources for quotations and the like, available on the Seaforth Publishing website at: **http://www.pen-and-sword.co.uk/The-Sailing-Frigate/p/3699/**

Further details of all the National Maritime Museum's ship models can be found on their Collections website at: **http://collections.rmg.co.uk/collections.html#!csearch;collectionReference=subject-90254;authority=subject-90254**

Searching by the SLR number quoted in the captions to this book will turn up a description of the model and any available photographs.

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POSTSCRIPT

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1: Prehistory
1600-1689

Over the centuries the term ‘frigate’ has carried a myriad of meanings, more often vague and suggestive rather than denoting a specific ship-type. The word itself is of Mediterranean provenance, and it is a reasonable assumption that the first vessels in northern Europe to be so described had the same origins: certainly, the first documented examples are privateers that operated out of the Spanish-held areas of the Netherlands as early as the 1590s. These were small, fast and lightly armed, characteristics that were to remain a common denominator of just about any ship called a ‘frigate’ whenever and wherever the description was applied.

To track the long and convoluted history of the term is more relevant to the lexicographer than the naval historian, and the aim of this book is to follow the evolution of a concept – a specialist cruising warship, not intended to fight in the line of battle but powerful enough for independent action in virtually every other naval role, in all weathers and on any ocean. These would encompass reconnaissance and other fleet support functions, both the attack and defence of trade, blockade and inshore operations, patrolling sea-lanes and suppressing piracy and smuggling. By the Nelson era the frigate had become the navy’s maid-of-all-work, the most flexible and broadly useful ship-type in the fleet and (with the exception of small craft) the most numerous category on the navy list.

SLR0368 On the basis of its decorative scheme this model is usually dated to just after 1660. 'The Shearnes' is painted on the upper counter, but there is no warship of that name, nor any built at Sheerness, that would fit. However, the model has the layout, proportions and, at 1/48th scale, roughly the dimensions of the first Parliamentary frigates, with the long heavily raked stem that was a feature of the time. The model carries a small poop and royalist decorations, but, like the full-size prototype, a model could be modified in the course of its life – and in 1660 republican symbolism was being removed throughout the country, from pub signs to warship names, to demonstrate loyalty to the newly restored King Charles II.

Note: The SLR number is the Museum's unique object reference. As most of the models have no names, it has been used throughout this book for unambiguous identification. For the few models from Annapolis, the HHR number performs the same function.

It was not always so. In order to fulfil all these functions the frigate needed speed, seakeeping, manoeuvrability, structural strength, firepower and a large capacity (in order to stow sufficient provisions for long cruising range). This was a demanding set of requirements, many of which could only be realised at the expense of others, and all trumped by the over-riding need to hold down the size – and hence cost – of individual ships, to maximise the numbers that could be built and manned. All naval architecture involves compromise, but the large number of variables in frigate design offered a particular challenge, leading to greater variety and more radical evolution than exhibited by the battleships of the same period.

This book charts the complex and sometimes wayward search for a perfect sailing cruiser through the medium of ship models from the incomparable collection of the National Maritime Museum at Greenwich. Because they are three-dimensional objects, models make it easier to see exactly what these ships looked like, and the best of them incorporate significant detail that is absent from plans and impossible to discern in most drawings and paintings.

Frigates first came to the attention of the English, painfully, during the 1625-30 war with Spain when the Channel was said to be 'infested' with swift-sailing privateers from the Flemish ports under Spanish control. During this period it was estimated that they captured over 300 ships, perhaps one-fifth of the English merchant marine of that time. The king's navy, a

traditional battlefleet of powerful but unhandy ships, was ill equipped to deal with the menace, and never produced an effective counter. The most concerted effort was a numbered class of ten sail-and-oar pinnaces measuring between 160 and 180 tons called generically the *Lion's Whelps.* They racked up some initial successes, but their performance deteriorated over time, probably because of the addition of heavier superstructure and more guns – the first example of a recurring theme in English cruiser design.

For all the concern with these 'Dunkirk frigates', the exact nature of their naval architecture was not at all clear at the time and has remained a mystery ever since. The term was applied to vessels from small sloops with a few guns to ships of 200–300 tons with anything up to 30 guns, so it is hardly surprising that a contemporary expert like Nathaniel Boteler could deny that they were a specific ship-type at all, reckoning them virtually indistinguishable from an English pinnace. However, in the descriptions of the time certain characteristics stand out: they were fast, with a low profile and very little superstructure, and so lightly built that their active careers might be as short as five years; and they could usually deploy oars to get themselves out of difficult situations. As the Duke of Buckingham, the Lord Admiral, expressed it, they were 'as fit for flight as for fight'; and when they fled, nothing in his navy could catch them.

After the war the opportunity to study the type in detail was afforded by the arrest of two such vessels, the *Nicodemus* and *Swan,* whose crews were accused of piracy. The latter became the model for two vessels of around 120 tons, the *Greyhound* and *Roebuck,* built in 1637 to the king's direct order by Phineas Pett; interestingly, while their designer referred to them as pinnaces, the king called them frigates. They were clearly not exact copies – another early manifestation of a recurring theme – because they were slower, but emphasised strength and seakeeping. When the *Roebuck* was sent to join the blockade of the 'Barbary pirate' base of Sallee in modern Morocco, the judgment was that 'though she is not a good goer yet she is strong and able to endure any sea'. Two much larger vessels of over 300 tons, the *Expedition* and *Providence,* were also designed specifically for inshore operations off Sallee; these oared craft were rated as pinnaces, but in their high length-to-breadth ratio they shared one of the characteristics of the Dunkirk frigates.

With the outbreak of the Civil War in 1642 most of Charles I's navy sided with Parliament, but the country was faced with the repetition of a commerce war for which it was not prepared. The Royalists were unable to assemble a battlefleet but they did commission many privateers, including hiring some of the notorious Dunkirk frigates. This time the government, which needed the parliamentary support of the merchant classes, was quick to take action in defence of trade, and the first three of a new class of frigates were ordered in 1645. *Adventure, Assurance* and *Nonsuch* were 32-gun vessels of about 380 tons, possibly derived from the *Expedition* and *Providence,* which they resembled in proportions, although there was no mention of oars. As built

they had eleven pairs of ports on the lower deck and a flush upper deck with five or six ports a side aft; at first there was no forecastle, so in layout they resembled some descriptions of the earlier Dunkirk frigates. However, it was soon found that they were too wet forward and in battle vulnerable to raking fire from ahead, so forecastles were added.

This is the earliest configuration of the frigate that it is possible to represent with a model. [SLR0368]

The evidence suggests that Parliament did not regard these ships specifically as cruisers, and in any case the follow-up ships were rapidly and radically modified. The outbreak of the first of three Anglo-Dutch wars spurred rapid improvements in the navy's discipline, fighting tactics and ship design, and one of its principal lessons was deemed to be the battle-winning advantage of firepower. As a result, the frigates had their waists filled up with extra guns, becoming genuine two-deckers, and the Commonwealth's naval administrators even developed much larger 'great frigates' that were the grandfathers of the eighteenth-century 74-gun ship. The Commonwealth frigate in its mature incarnation must have looked rather like model SLR0367.

SLR0367 Although damaged, this contemporary model is a valuable depiction of the overall appearance by the early years of the Restoration of a Fourth Rate or a large Fifth (there was a lot of reclassification between these rates in the 1660s). They were now full two-deckers, with a small poop. The ship maintains a feature of earlier frigates in the ability to deploy sweeps (there are eighteen oar ports a side on the lower deck). As ships grew larger this facility lost popularity, but as late as 1681 the Fourth Rate *Tiger* was rebuilt in this configuration and was referred to as a galley-frigate.

SLR0005 This Fourth Rate of about 1685 is typical of the kind of ship that performed many of the cruising duties under Charles II and James II. At the usual 1/48th scale it measures about 123ft by 34ft and may represent the 50-gun *Sedgemoor* of 1687 which, unusually for this rate, carried only 20 guns on the lower deck instead of the regular 22. At this period the flat transom of the so-called square-tuck stern would have been unusual, although there is evidence that the contemporary *St Albans* of the same rate had this feature.

Perhaps the greatest technical advance of the era of the Dutch wars was the emergence of organised fighting tactics. In the 1650s fleets still fought an essentially melee battle in which ships of all sizes could play a part, but the advantages of fighting in a line ahead formation soon became obvious as it made the best use of the firepower of ships whose guns were massed on the broadsides. The 'line of battle', as it was called, rapidly became the accepted disposition, and this in turn encouraged the concept of a 'line of battle ship' – 'battleship' for short – which could only be applied to ships powerful enough to take their place in the line. At first this extended down the fleet list to relatively small ships of around 40 guns (Fourth Rates) but, whatever their size, all these ships shared the same characteristics: multiple gun batteries on at least two complete decks and construction robust enough to withstand battering at close quarters.

Although the Dutch wars produced a ship optimised for fleet engagements, it did not inspire a specialist cruiser. There *were* ships too small to stand in the line, but they had very limited uses and were built in very restricted numbers. The smallest rating, the Sixth of around 14 guns or less, mainly performed inshore duties, to counter smugglers and local privateers; for example, the three ordered in 1651 were intended 'to ply among the sands and flats to prevent pirates'. In many ways they were the ancestors of eighteenth-century sloops.

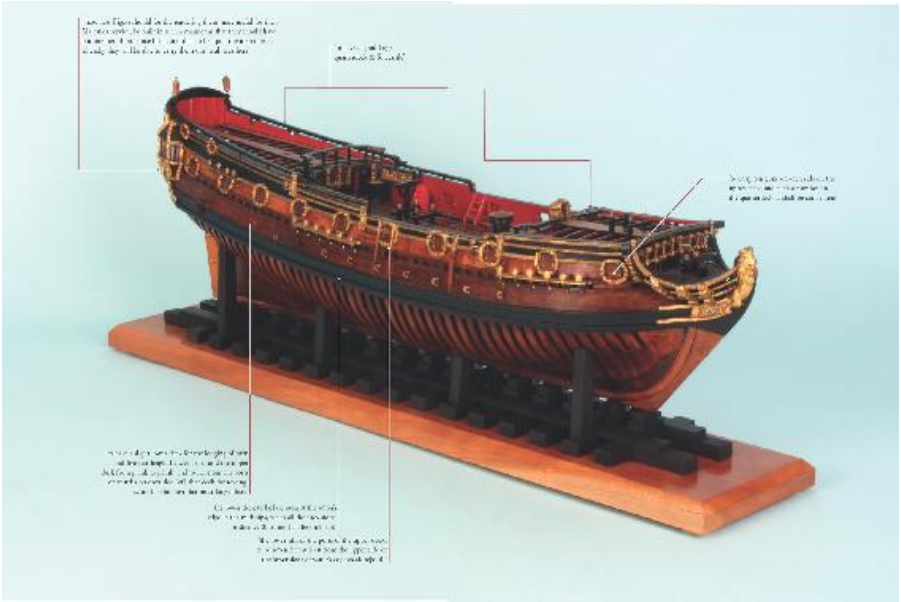
The larger Fifth Rates, armed in the 1650s with around 22 guns, grew in the following decades to carry around 32 guns. In layout they were originally reduced versions of the early Commonwealth frigates, with a single lower deck battery and a few guns aft on the upper deck, but in time they too acquired a forecastle and the larger of them became two-deckers when their waists were filled with guns, generally being rerated as Fourths. At a time when the largest merchant ships outgunned them, their value as warships was limited, and they were rarely deployed individually, although they did convoy escort work and joined squadrons on some of the less demanding stations. However, there was a design emphasis on sailing qualities, especially on manoeuvrability ('nimble' as it was expressed in the seventeenth century) and there was a specific reason for this. In fleet battles they had a role which was unique to that era: defending bigger ships from fireship attack and, conversely, clearing the way for their own fireships' offensive.

Most of the roles that would fall to the eighteenth-century frigate were at this time performed by Fourth Rates. These small two-deckers were extremely useful ships, large enough to stand in the line of battle, but small enough to be built in relatively large numbers – and between the Civil War and the

Glorious Revolution more than twice as many ships of this class were constructed than Fifth Rates. Outside the main battlefleet, they served in minor squadrons, provided the local ship of force on more remote stations, and were much involved in the attack and defence of trade.

Although Fourth Rates were built strong enough to survive a fleet action, their sailing qualities were not entirely ignored. Some (like SLR0005) had decidedly fine lines, and there is documentary evidence than many were considered fast, but as two-deckers their height of side would always hamper their performance to windward, making them less weatherly than sleeker ships. They were generally seaworthy and capable of long-distance deployments, but their lower gundeck ports were too close to the waterline to be opened in anything more than a moderate seaway, so they could not be regarded as all-weather cruisers. In truth, they were compromise warships that could perform most functions adequately but were not optimised for any one role – jacks of all trades but complete masters of none.

The invasion of 1688 which replaced King James II with William and Mary was called the Glorious Revolution, and it brought with it a revolution in foreign policy that in turn revolutionised the strategy and tactics of the sea war. England, after a generation of fighting the Dutch, was now co-opted into 'Dutch William's' long-running conflict with France. This presented an entirely new challenge to the Royal Navy, and its administrators were aware that it would be a different kind of war from anything they had experienced previously. Among the first responses to this novel scenario was a programme of new Fifth Rates, to be built to a radical design concept proposed by Lord Torrington, the First Lord of the Admiralty. His specification, dating from June 1689, has a good claim to being the first conscious attempt to build a specialist cruising ship in the age of sail, and hence the first real frigate.



Lord Torrington's Specification

This model is a unique contemporary depiction of the new Fifth Rates as originally conceived (with the requirements indicated in the original wording of the specification). As built, they varied in details – particularly in the number of ports on the lower deck, but the dimensions of the model are a perfect fit for the early ships of the class. They eventually mounted 32–36 guns, the main battery being sakers (6pdrs) with six, eight or occasionally more of the larger demi-culverins (9pdrs) on the lower deck, right forward and/or right aft where the sheer of the deck gave the ports most freeboard. Although the ports did not face directly forward or aft, they were originally described as chase guns, but in the right conditions they must have given the ships a little extra punch. Because of this partial lower deck armament, they are sometimes described by the French term *demi-batterie.*

HHR14 US Naval Academy Museum, Annapolis, Maryland

2: Guerre de Course
1689-1713

Torrington's new frigates were built in anticipation of a strategic situation that would be very different from what had gone before. Recent experience had been confined to war with the Dutch, a maritime trading nation like England, that had to bring their considerable commerce home through the narrow seas around the British isles. To achieve this the Dutch battlefleet could not avoid fighting its English equivalent, and the wars became a series of hard-fought slogging matches, usually in coastal or confined waters. Both navies had some small craft not committed to the line of battle, but more often than not these sloops and pinnaces were designed to serve the fleet as auxiliaries and not for the attack or defence of trade, which tended to be moved in large convoys screened by the battlefleets. As a result even commerce warfare was on a relatively large scale, typical examples being the unsuccessful assault on a 70-strong Dutch convoy sheltering at Bergen in 1665 or the infamous 'Holmes's bonfire' – the destruction of 150 Dutch merchantmen in the Vlie anchorage – the following year. These were squadron actions where even the close escorts were usually small line of battle ships or whatever could be spared from the main fleets. In such circumstances there had been no call for specialist cruising ships.

SLR0393 This model of a Sixth Rate has '1706' and 'B.R.' engraved on the supporting brackets, the initials of Benjamin Rosewell, who was appointed Master Shipwright at Chatham in that year. No ship of this type was built in 1706, so if the model was a celebration of his achievement, it probably represents a vessel he was associated with earlier in his career. One contender is the *Flamborough* of 1697 built at Chatham while Rosewell was jointly Assistant Master Shipwright with William Lee. The ship was lost at the end of 1705 after an epic battle with a French 54-gun ship, so it would be an appropriate memorial. Although this is pure speculation, William Lee is thought to have been a keen modelmaker, and he himself became joint Surveyor in 1706, so given the highly personal nature of the apprenticeship system, such a present to a friend or protégé is not unlikely. The model itself is similar in most important respects to the *Lizard,* the major difference being one less main deck port and rather less decorative work – both possibly the result of a more recent refit.

Those in England who had considered the nature of any future war with France expected Louis XIV's expensive new battlefleet to be carefully husbanded, while the principal strategy became one of commerce warfare. Against the Dutch, England had been the predator, and in terms of merchant ships gained or lost, the net winner by a large margin. Now the boot was on the other foot: England, and its new ally the Netherlands, offered the tempting target of the world's largest carrying trade, and although France initially confounded the experts by attempting a battlefleet strategy, the crushing defeats of Barfleur and La Hogue in 1692 put paid to this short-lived ambition, and heralded the beginnings of the obsession with commerce warfare that was to dominate French maritime thinking for two centuries.

Besides a novel strategic situation, the Royal Navy of the 1690s also faced new geographical challenges. The Dutch wars were largely fought in the Channel and North Sea, in coastal waters often so shoal that fleets would anchor to sit out the effects of an adverse tide; while damaged ships were assured of a friendly port at no great distance. However, the French war brought the prospect of operations off the wild and inhospitable Biscay coast, since the main French Atlantic base was at Brest. Furthermore, both British and Dutch trade in what a later era called the Western Approaches would be very exposed to flank attacks from French commerce raiders for large parts of

its voyage, both outward and homeward bound.

Torrington's innovative ships were clearly intended to meet the new circumstances. The emphasis was on all-weather capabilities (the 7ft freeboard to the gunports), habitability (a clear, well-aired lower deck to give the crew more reasonable conditions), and sailing qualities (the lower deck was set at the waterline to reduce the height of side, to make them more weatherly). They also had a high length-to-breadth ratio for speed, but were not as long as the three 'galley-frigates' built previously that were optimised for rowing; these were built specifically for operations against North African corsairs, and had a specially large crew of oarsmen (originally recruited from very reluctant Thames Watermen). It is tempting to see these ships as the inspiration for Torrington's concept, since they were generally similar in layout – but so were most large merchantmen of the time, with a gunport or two fore and aft on an otherwise clear lower deck. The new frigates *were* equipped for rowing, but they had only half the number of oar ports and were never allocated an enlarged crew, so this was an auxiliary function, useful to give the ship some movement in flat calms and to manoeuvre in confined waters.

Perhaps most importantly, at about 105ft by 27ft and 360 tons they were small enough to be built in large numbers, and around thirty of these ships were to see service by the end of the war. They were the mainstay of the cruiser force, but in 1693 a modest programme of new Sixth Rates was put in hand. These were more conventional than the half-battery Fifths, and little original thought seems to have been given to their design. On 7 July 1693 the Admiralty requested 'with all speed, a small, light, good sailing frigate … of the 6th Rate, to carry about 20 guns …' The Navy Board committee on their design consisted of the Surveyor, the Comptroller and one other Commissioner, Capt Willshaw, and they came up with a wholly conventional single-decker, much like those that had been built for the past twenty years, armed with twenty sakers (approximately 6pdrs) and four 3pdrs. In total eighteen were built between 1693 and 1697, and there is no evidence that they varied in any substantial way one from another.

Their appearance as built is beyond doubt, since the Pitt Rivers Museum in Oxford has a well-documented model, apparently of the *Lizard,* while a contract specification for the *Swan* confirms the details. However, the main features of this type can be seen in model SLR0393, which, although dated 1706, represents earlier practice.

In terms of the sea war, the conflicts of 1689-97 and 1702-12 might be seen as one long struggle against what the French called the *guerre de course,* the war on trade. Although this involved privateers – state-licensed private corsairs – and individual warships, what proved most difficult to counter was the hiring out of medium-sized warships to privateer consortia, who operated them in squadrons, sometimes in conjunction with naval forces proper (in convoy attacks the navy tackled the escorts while the privateers snapped up

the merchantmen).

This had come about because the French battlefleet was largely laid up after 1692 and the state of French finances was parlous – as it usually was after a few years of war. This was a cheap form of maritime warfare, using otherwise idle assets; it was also nearly impossible to defeat by conventional means since the Anglo-Dutch navies could not spare enough ships and most of those available were not powerful enough to withstand these squadronal attacks. Having failed at both close blockade and hunting down the most notorious privateers, the allies responded with desperate ingenuity, attacking the 'vermin', as one naval officer put it, 'in their holes', trying amphibious assaults and a string of bombardments of privateer ports using bomb vessels and explosion boats – where the new Fifth Rates, with their ability to manoeuvre under oars, proved very useful in inshore support roles – but it was all to no avail. By the end of the first war, nobody in the allied admiralties believed the problem had been solved.

Nor did anyone believe the peace would last, so it was important to implement any lessons that could be gleaned. The half-battery Fifth Rates had suffered heavily in combat, so they were largely replaced after 1700 by more powerful fully two-decked 40-gun ships. Many losses had involved boarding, a tactic encouraged by the larger crews on French warships and privateers, whereas the English were more inclined to rely on gunnery. However, ships with open waists could not fight their guns while repelling boarders, so it was decided to build future cruisers 'with a deck over the guns', the idea being that the main battery might drive off the enemy ship even as its boarders fought for possession of the deck above. This was not the official reason, as given in the August 1702 order for Sixth Rates, the first of the newly declared war. These were to be 'such a vessel as the *Swan* [of 1694] … the said ship to have 24 guns and to have a slight deck over the guns in the waist, as well to prevent any dangers which may happen from shipping seas, as for keeping the guns clear from the rigging which may fall upon the deck in time of action …'. However, there is evidence that a major preoccupation of the time was with ways of making the cruisers 'defensible' against boarding – one of the more bizarre involved spring-loaded explosive devices that could be fired from below to clear the upper deck, and this was actually tested on two ships in the 1690s.

SLR0397 The best example of the new pattern Sixth Rate with the 'slight deck' – in effect, a spar deck – over the battery is a model in the Thomson Collection at the Art Gallery of Ontario that probably represents one of the first, the *Nightingale* of 1702. It shows the spar deck to be comprised of grating, a throwback to the early seventeenth century when the waist was often covered in this way. However, the Greenwich collection includes this model, which because of the number of gunports is usually catalogued as a 30-gun ship. In fact, the eleven main deck ports and light spar deck show it to be a Sixth Rate, although none of the Navy-built ships matches the detail. In December 1706 the Deptford officers were sent to look at a new private-venture building at Blackwall, and reported that the ship '… can carry 24 guns like the other Navy 6th Rates, but may conveniently have ports for 28'. She was purchased as the *Aldborough* and armed with only 24 guns. This model is made to a smaller than usual scale and at 1/64th (3/16th of an inch to the foot) the dimensions are a close fit to the *Deal Castle,* similarly purchased from a merchant builder. It may not be a firm identification, but it is certainly the right kind of ship – and it underlines the fact that most ships of this time had more gunports than guns.

The pink stern as shown off in a model of a Sixth Rate from about 1702, which also features the other innovation of the period, the spar deck over the gun battery. This suggests that a Sixth Rate of this design was seriously contemplated although none was actually built; the Fifth Rates that *were* built must have looked like scaled-up versions.
HHR13 US Naval Academy Museum, Annapolis, Maryland

The search for improvement was to throw up a number of ingenious, if not downright odd, suggestions. In April 1702 the Lord High Admiral and the Navy Board met to discuss ‘a model lately made by the Surveyor of a 5th Rate Frigate with a deck over her guns, pink fashion, and the same being very

well approved of' the Navy Board was then ordered to build one at Woolwich 'according to the said model'. The ship became the *Tartar* and two similar vessels, *Falcon* and *Fowey,* were also built. Other Fifth Rates ordered at this time were conventional 40-gun ships, but these were half-battery 32s, identical in layout and armament to those built previously, with the exception of these two noteworthy features. The deck over the guns has been dealt with, but what was meant by 'pink fashion'?

This referred to a very narrow 'pinched-in' stern, the shape of which is perfectly illustrated by an exactly contemporary model in the US Naval Academy Museum in Annapolis [HHR13]. The advantages of the pink stern are demonstrated by this model in a way that no document could reveal. Unlike the framing of a square stern where the transom timbers are rather weakly connected to the main framing, the pink has almost a repeat of the bow timbering. Furthermore, instead of the traditional wide, largely glazed stern gallery that was such a good target for raking fire, the pink offers a very narrow prospect indeed. The disadvantages, though, do not take much searching out: the ship is so fine aft that the lack of buoyancy – 'bearing' as it was called at the time – would have made her very vulnerable to being pooped in a following sea. In fact, the *Tartar*'s captain had to apply for the replacement of the six lower deck demi-culverins (9pdrs weighing 24cwt each), four of which were carried aft, with 3pdr minions of 6cwt, the same calibre as the ship carried on the quarterdeck presumably for this very reason. His letter describes the ship, accurately, as built 'in a different manner from' any other Fifth Rate in the Navy.

SLR0400 The new Sixth Rates of 1710-12 were very low (note the highly unusual feature of sideways-opening gunports in the waist), virtually no rails or bulwarks to quarterdeck and forecastle, no spar deck, and no way of unofficially augmenting the 20 guns the new ships were established with. In fact, the Navy List of this period makes a clear distinction between the older 24s, with guns on the upperworks and a total sometimes exceeding 24, and the new 20s; even the Ordnance records for the period confirm that these ships did not carry more than 20 guns, under any circumstances. The model even lacks a figurehead, perhaps suggesting that it was still a matter of debate when the model was produced.

SLR0419 SLR0382 It used to be said that official Admiralty or Navy Board models were made as part of the design SLR0382 process, but as the more elaborate examples would take as long to build as the ships they depicted, this was manifestly untrue. There is plenty of documentary evidence that 'models' were produced at the same time as plans, but the references are to 'solids' – either full-hull block or half-models that could be carved quickly. Among the oldest that survive are these two, which represent opponents in the trade warfare of the conflict over Spanish Succession. *Ludlow Castle* (1707) was one of the 40-gun two-deckers built to replace the half-battery 32-gun ships, whereas *Triton,* a French 42-gun ship of 1697 captured in 1702, was typical of the threat they were built to face. Although the ships carried a roughly comparable armament, at 660 tons to 530, the French ship was 25 per cent larger. The larger tonnage went into a finer hull form, which usually meant better sailing qualities – indeed, a higher ratio of armament to tonnage became a feature (and, some said, a besetting sin) of British warship design in the eighteenth century. The model records the French ship's very sharp lines, and is an early example of the Royal Navy's consistent policy of analysing ships taken from its enemies in detailed surveys, plans and, in some cases, models.

SLR0406 There is an Admiralty draught of the *Success,* of 1712 with resembles SLR0400 very closely, except that it shows eleven ports a side and the channels have been raised to the mid-point of the gunports. Therefore, it is likely that the later Sixth Rates of the 1710-12 group looked more like this model – certainly after peacetime fitting out. It was a common phenomenon for 'habitability' to become a greater priority for cruising in peacetime, and the more extensive quarter galleries certainly suggest more concern for the captain's comfort.

None of these expedients made a significant impact on the *guerre de course,* where French success put increasing pressure on the Admiralty to find a solution to mounting losses among the merchant fleet. In terms of cruiser design, they vacillated: after the pink-sterned experiments, they returned to two-decked 40s; these were widely criticized for poor sailing qualities, so there was a brief reversion to half-battery 32s, then back to 40s again; even the Sixth Rates were now considered over-built, and by 1710 the Surveyors of the Navy were instructed by the Admiralty to consider 'what may most properly be done for her Majesty's ships of the 6th Rate to render them better sailers'. The Surveyors proposed reducing the weight of their tophamper – especially the rigging – and recommended that in any future refit 'all superfluous weight in their upper works' be reduced, and for new construction the scantlings and room and space be 'abated in many parts' – in other words, they were to be more lightly constructed, with more space between the framing.

This was formalized the following year when the Admiralty, in setting out the pressing need for more ships of 40-guns and 20-guns, informed the Navy Board 'that it was our opinion the 6th Rates should be built with one deck only and a small, low forecastle; that the 5th Rates ought to be made somewhat larger; and that neither the one nor the other should carry any guns on their quarterdecks; and that instead of a lion on their heads, it may be more convenient to place some very light figure thereon, or a painted board … '. Among other things, this meant the end of the spar deck over the guns. The NMM model SLR0400 is a perfect depiction of the resulting ships.

LORD DANBY'S MAGGOT

The Navy's official shipwrights are often accused of ultra conservatism, but English cruiser design is also indebted to at least one eccentric, wayward and amateur genius. Peregrine Osborne, Lord Danby was at times a spendthrift, a quarreller and a womaniser, but his overriding passion was ship design. His life-long enthusiasm for speed under sail began at an early age and his expensive hobby exposed his father, the Duke of Leeds and a leading minister in William III's government, to satirical comment:

> I must needs tell you he's at great charges
> For his son Danby's Yachts and Barges.

However, his yachts and barges were successful enough to attract real admiration. Danby pursued a career of mixed success as a naval officer, but he was renowned in the fleet for his *Bridget Galley,* described by Sir Cloudesley Shovell as 'an incomparable sailer'. Nominally a tender to his command, the 70-gun *Resolution,* the galley was operated by Danby as a speedy and highly successful privateer. Even his captain's barge – again to his own design – was the envy of flag officers.

Exploiting his connections at Court, he went on to design the *Royal Transport,* a fast yacht for the king's personal use which so impressed Czar Peter the Great during his visit that it was presented to him. There is a model in the naval museum in St Petersburg which claims to be this ship, but it is a nineteenth-century identification, and has none of the capacious accommodation the *Royal Transport* is documented as possessing. Furthermore, the rig of the model – sometimes described as the first identifiable schooner rig in history – is at odds with the evidence that at least one mast was square rigged.

SLR0394 Originally in the Mercury Collection, by tradition this model was known as the *Carolina,* a yacht converted from Danby's *Peregrine Galley.* Although it is very heavily decorated, with a lot of accommodation aft like a royal yacht, this identification was dismissed by R C Anderson, who first catalogued it, because the dimensions did not fit, and plans and paintings attested to the yacht carrying a ship rig, whereas this model has only two masts. No other royal yacht fits the model's characteristics either. However, John Franklin, an expert on Navy Board models, has since proved beyond reasonable doubt that official models used many other modelling scales besides a quarter-inch to the foot. In fact, this model has the proportions of the *Carolina* ex-*Peregrine Galley* at a scale of about 1/44. Now Danby is precisely the sort of man who would want to celebrate his own ingenuity with a model – particularly since the building of the ship represented a financial victory in a long fight with authority to obtain compensation for a promised pension which had not been forthcoming.

On this model the position of the main mast seems very far forward, and the rig looks so unbalanced there is a strong temptation to look for some sort of mizzen to turn it into a conventional ship rig; but there is absolutely no evidence for one. According to Deptford Dockyard records, the *Peregrine Galley* was first built with a light two-masted square rig, but suffered an acute lack of after-sail (the main probably carried some kind of bilander sail, which fits with what is known of the *Royal Transport*'s rig). The Dockyard felt that the only solution was to rerig the vessel completely with a full ship rig, and this was carried out in January 1703, barely two years after the *Peregrine* was completed. This is why most of the iconography shows the vessel as a three-masted ship.

There is one clinching piece of evidence: when the ship was employed, in effect, as the Duke of Marlborough's yacht, carrying him to and from his continental campaigns, there was criticism of the ship's domestic arrangements. The most startling of these was that the galley was the wrong way round with the fire hearth facing the magazine. Careful inspection of the model reveals this very feature.

The *Peregrine Galley* shared the Danby reputation for fast sailing, and the hull form was to be very influential in the half-century that followed. As late as 1756, when the first 12pdr frigates were being designed, the *Richmond* class were based on this form. This design in turn was repeated in 1801 so Danby's influence on cruiser design could be said to stretch over a century.

Having lost the *Royal Transport,* Danby later persuaded the government to fund the *Peregrine Galley,* another innovative yacht for his own use, but again it was so popular with the monarch that it was retained in naval service. Persevering with his desire for the state to fund his hobby, Danby capped his semi-official career with the outlandish *Royal Anne Galley,* a two-decker designed to be rowed with 66 oars on both decks. But strangest of all was a privateer he designed with a wasp-waist midship section – as if the ship had breathed in at the waterline – known, perhaps appropriately, as 'Lord Danby's Maggot', 'maggot' being seventeenth-century slang for an unhealthy obsession.

3: The Establishment Era
1706-1748

England – or more accurately after the 1707 Union with Scotland, Great Britain – emerged from the long wars of 1689-1713 the victor at sea, but the Royal Navy had not learned how to cope with the threat of French commerce warfare on a strategic, tactical or technical level. Nevertheless, under the pressure of this new kind of sea-war, lessons had been learned and innovations tested. The 1690s proved to be one of the most inventive periods of the whole age of sail, with entirely new ship-types – like brigantines, advice boats, bomb vessels and the first specialist cruisers – joining the fleet. The new regime of William and Mary was ushered in by what history calls the Glorious Revolution, but at sea there followed a hitherto unrecognised revolution in technology, with numerous small changes adding up to a massive advance over the next quarter-century.

In terms of warship design, these developments were generally aimed at enhancing sailing performance and seakeeping: detail improvements included moving up the channels that spread the shrouds by a deck, so they were less vulnerable to wave damage; the jib was introduced, replacing the cumbersome and vulnerable sprit topsail in all but the largest ships; and, the most poorly documented but potentially the most radical, the invention of the steering wheel. Even the well-known restriction on carved work introduced in 1704 and usually seen as an economy measure, was just as much a matter of reducing weight and windage. All these advances made ships more manoeuvrable and, when combined with initiatives like issuing extra spare topsails and increasing ammunition allowances, suggest a concern to make British ships more responsive to the demands of distant-water, all-weather cruising.

The fleet of the Dutch wars had been optimised for firepower and strength, with sailing qualities and endurance a distinct second – the largest ships, for example, were only commissioned in the summer months, and were never sent abroad. British ships were over-gunned when compared to their enemies,

and their sailing qualities were poorer in consequence. This emphasis on weight of metal, literally, was recognised as inappropriate in the new conditions and in 1703 a new establishment of guns was drawn up, specifying the number and type of weapons to be carried on each class of ship. Sensibly, this generally reduced the weight of armament per ship, but its application was problematical because, while the guns were now standardised, the ships were not; it had been common to have more gunports than guns carried, but now the opposite was often true, with more guns 'established' than there were positions for.

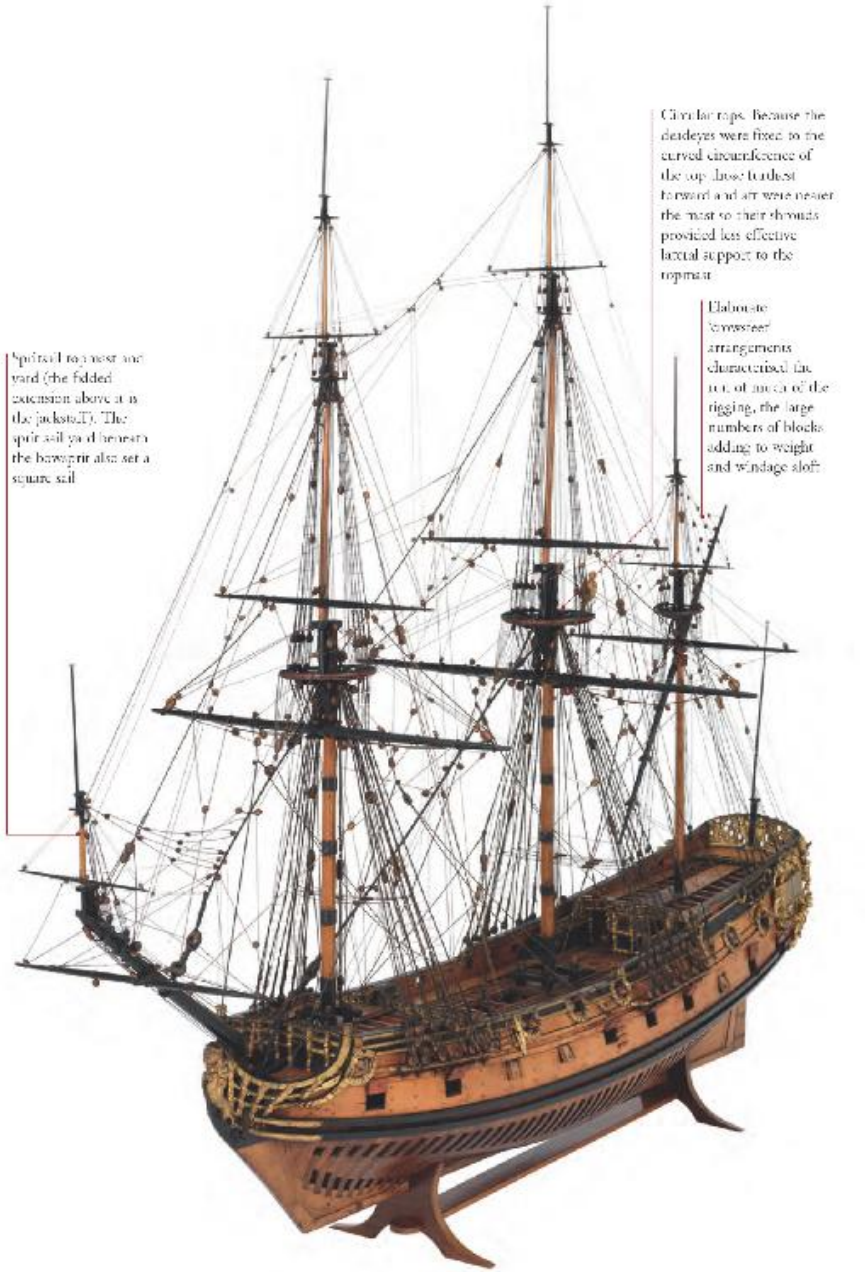
The concept of an Establishment – a universal template of allowances – was a long-standing and logical tool of administration, aiming to standardise the supply of everything from stores to guns and ammunition. However, the administrator's ideal of uniformity was never achieved because the ships themselves remained so disparate, and the 1703 gun establishment foundered on this very rock. The answer was a radical extension of the notion of an establishment to cover the actual ships and in April 1706 the Admiralty accepted the proposed list of dimensions thrashed out, after much debate, by a committee of senior shipwrights and private ship-builders. It did not standardise the *design* of each type, but the dimensions were detailed enough to dictate the layout and, of course, the armament on each deck. This 1706 Establishment did not cover First Rates (too few built to warrant standardisation) nor Sixth Rates (too small to benefit from it), but although the 1703 gun establishment had suggested little alteration in the two smallest rates, the new provisions included Fifth Rates of 40 and of 30 guns. A significant number of the former were built (thirteen plus two almost identical ships purchased on the stocks) between 1707 and 1715, but there were only two 30-gun ships to 1706 Establishment dimensions. These were half-battery ships and similar in size and layout to their pink-sterned predecessors, apart from a conventional transom and omission of the spar deck over the main battery.

All the half-battery ships had generally enjoyed a reputation as good sailers, so this preference for small two-deckers (which did not) strongly suggests that the lesson being drawn from the war was that the 'heavy' cruiser needed more firepower. On the other hand, the 'light' cruisers of the Sixth Rate, having been lightened in structure and reduced in armament, proved wet and uncomfortable, with their only battery too close to the waterline to guarantee they could fight in all weathers; no more of these were to be added after the end of the war in 1713. Although built in large numbers in the 1690s, the half-battery ships were clearly judged inadequate in the long run, but it is only fair to point out that, as built, they were a distortion of Torrington's original concept, with a relatively heavy armament on the lower deck where he had intended none, and more substantial upperworks that increased their windage and degraded their sailing qualities.

However, his ideas were about to stage a comeback and – with a nice

irony – through the medium of the original ships. As part of post-war retrenchment in 1717 the Admiralty decided to rationalise the Navy's large number of ships with less than 40 guns, for which there was less peacetime demand. Some of the worn-out 32s were to be made fireships but four of the oldest – *Experiment, Rye, Lyme* and *Sheerness* 'being of smaller dimensions and having the character of pretty good sailers' – were to be given a radical makeover. The roundhouse (poop) was removed, the quarterdeck and forecastle drastically shortened, and the height of side reduced to make the ship 'easier' in a seaway and otherwise improve her sailing; there were no quarter galleries and the topside was to be as 'light and snug' as possible. There was a renewed emphasis on rowing (by this date some had no oar ports at all) so all but two lower deck gunports (one each side of the mizzen mast) were stopped up and twelve oar ports and a ballast port amidships were provided on each broadside, to allow the ship to row with thirty oars by using all of the lower deck openings. The ships had ten gunports a side on the upper deck, but two of the established twenty 6pdrs were to be carried on the lower deck. They were then classed as Sixth Rates.

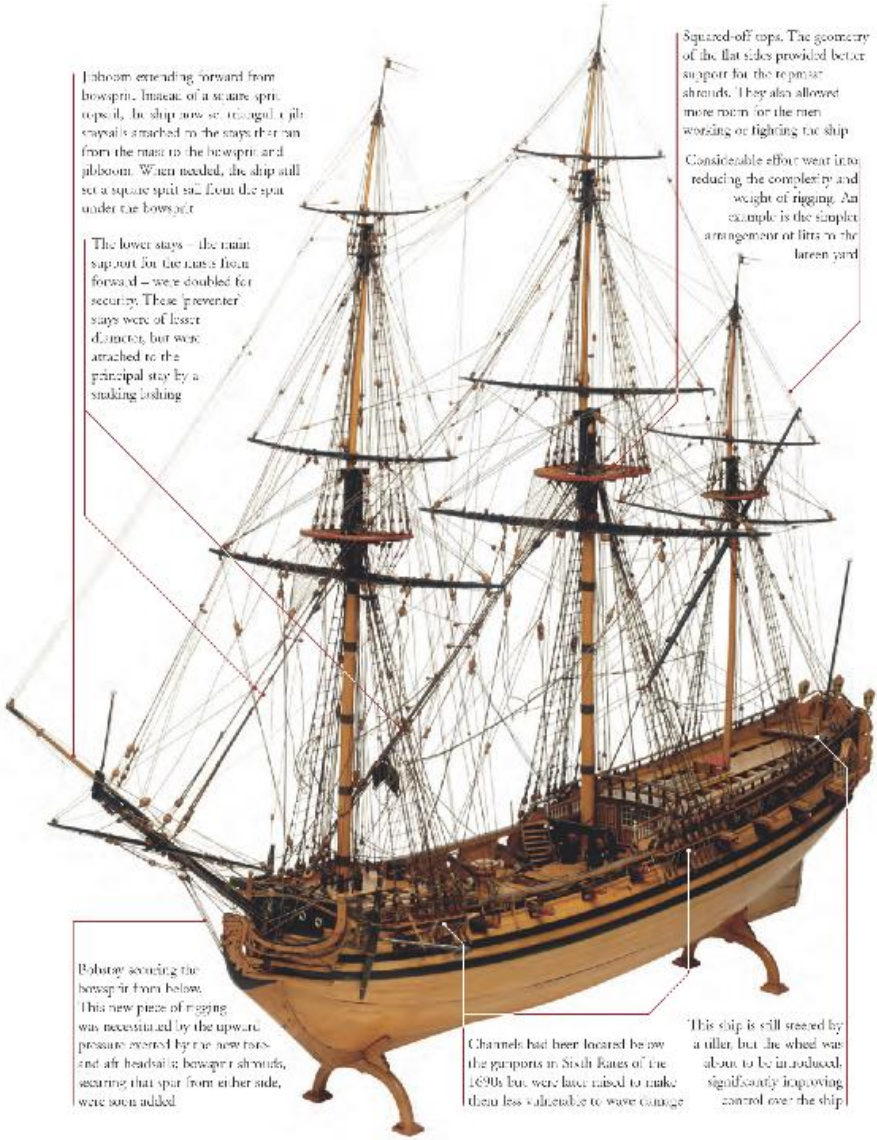
Very few Sixth Rates were built in peacetime, but the following year one was ordered and launched in February 1719. This ship, the *Dursley Galley,* was built at Deptford by Richard Stacey, who was told to 'prepare a Draught and Solid of such shape and dimensions as may have the greatest possibility of sailing well'. Inspired by the recently rebuilt ex-Fifth Rates, he modified the layout to delete the lower deck gunports, while retaining the ballast port amidships and increasing the number of oar scuttles; the upper deck now showed eleven ports a side. When a new and more thorough Establishment was promulgated later in 1719, it was felt unnecessary to go any further for a model than this ship, 'which works [manoeuvres] and sails well'.


Circular tops. Because the deadeyes were fixed to the curved circumference of the top, those furthest forward and aft were nearer the mast so their shrouds provided less effective lateral support to the topmast
Elaborate 'crossover' arrangements characteristic of the rig of most of the rigging, the large numbers of blocks adding to weight and windage aloft
Spritsail topmast and yard (the folded extension above it is the jackstaff). The spritsail yard beneath the bowsprit also set a square sail

SLR0005 SLR0398 **Overleaf** The detail improvements in rigging around the turn of the eighteenth century can be seen by comparing this Fourth Rate of about 1685 with the Sixth Rate of about 1710 (the latter boasts largely original rigging). The most obvious change to the sail plan is the replacement of the fragile-looking spritsail topmast perched on the end of the bowsprit with a jibboom, and consequently the former's square sail with triangular jibs. These new fore-and-aft sails improved the ship's performance to windward, and the change seemed so obvious to later sailors that its delay for so long appeared blindly conservative. However, when replicas of early ships began to be built, it became clear that the sprit topsail was of real value when tacking the ship, so it is not surprising that it survived longest on the largest, least handy ships and that the jibboom was first introduced in the smaller ships,

for whom sailing qualities were more important.

The large number of small but significant developments in rigging of this era must surely reflect the experience of fighting the more global campaigns of the French Wars of William III and Queen Anne. The underlying themes of these improvements are, on the one hand, to make the tophamper more robust (better able to withstand the violence of the elements or the enemy), and on the other, to make the ships more seaworthy and better sailers. Under the first head would come the moving up of the channels by one deck to reduce the risk of wave damage; the squaring off of the back and sides of what had been round tops to improve the support given to the topmasts by their shrouds; and the introduction of preventer stays to make the lower mast stays less vulnerable. The biggest improvement to sailing qualities – the introduction of jibs already mentioned – meant alterations to the bowsprit which needed more support against the 'lifting' effect of the new headsails, so a bobstay now secured it from below and bowsprit shrouds from the side. Besides jibs, fore-and-aft canvas was increased by additional staysails, while the fair-weather sail plan was greatly enlarged by studding sails – temporary canvas carried at the ends of fore and main lower and topsail yards – that came into regular use during the 1690s. For the other end of the weather spectrum, extra rows of reef points were added to most square sails which, when combined with the fact that extra spare topsails were issued to all ships, strongly suggests that the fleet was now expected to stay at sea longer and cope with harsher conditions. Although it is not much appreciated, 1690-1715 saw a step-change in the seakeeping capabilities of the Royal Navy's warships.


Squared-off tops. The geometry of the flat sides provided better support for the topmast shrouds. They also allowed more room for the men working on fighting the ship
Considerable effort went into reducing the complexity and weight of rigging. An example is the simpler arrangement of lifts to the lateen yard
Jibboom extending forward from bowsprit. Instead of a square sprit topsail, the ship now set triangular jib sails attached to the stays that ran from the mast to the bowsprit and jibboom. When needed, the ship still set a square sprit sail from the spar under the bowsprit
The lower stays – the main support for the mast from forward – were doubled for security. These 'preventer' stays were of lesser diameter, but were attached to the principal stay by a snaking lashing
Bobstay securing the bowsprit from below. This new piece of rigging was necessitated by the upward pressure exerted by the new fore- and aft headsails; bowsprit shrouds, securing that spar from either side, were soon added
Channels had been located below the gunports in Sixth Rates of the 1690s but were later raised to make them less vulnerable to wave damage
This ship is still steered by a tiller, but the wheel was about to be introduced, significantly improving control over the ship

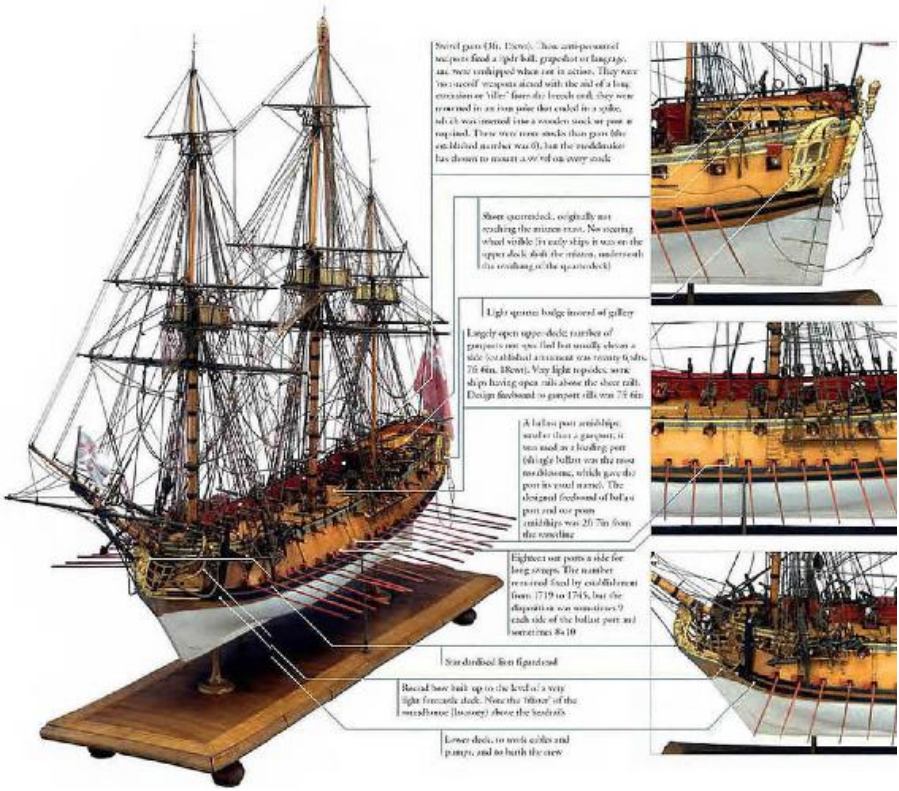
SLR0420 Although damaged, this model of the *Lowestoffe* demonstrates what the reconstruction of half-battery Fifth Rates was intended to achieve. The main battery on the upper deck retained its impressive freeboard of around seven feet, but everything above that was cut back – the forecastle (missing from the model) was an open-backed platform, fit only for sail-handling, while the very short quarterdeck did not stretch as far forward as the mizzen, nor even the aftermost gunport. The injunction to keep the upperworks as low and light as possible is most evident in the waist bulwarks, which are only solid up to the mid-height of the ports. Originally built in 1697, *Lowestoffe* was not ordered to be rebuilt until 1722, so many other aspects of the fitting out – particularly the lower deck arrangements – follow the modifications introduced by the 1719 Establishment. These were supposed to produce standard ships but, curiously, this ship (as confirmed by the draught) had only ten gunports a side, whereas eleven was the norm, even though they were only established with 20 guns. The Establishment, for all its apparently rigid detail, specified the number and nature of lower deck apertures, but not the number of upper deck ports.

SLR0411 The three-masted ship rig of this period had replaced the spritsail topmast with a jibboom; aft the long mizzen yard was unchanged, but there was a tendency for the sail to be cut short and its leech (forward edge) to be lashed to the mizzen mast itself

THE FRIGATE ABOUT 1720

In the naval architectural sense, the only specialist cruiser design in the first half of the eighteenth century was the Sixth Rate of 20 guns (24 guns from

1733), a two-decked ship with no guns on the lower deck. This model is not only one of the most detailed of the type, but also the most accurate representation of their earliest appearance.


Swivel guns (Bk. Dews). These anti-personnel weapons fired a light ball, grapeshot or langrage, etc. were unshipped when not in action. They were 'no-recoil' weapons aimed with the aid of a long extension or 'tiller' from the breech end; they were mounted in an iron yoke that ended in a spike, which was inserted into a wooden stock or post as required. There were more stocks than guns (the established number was 6), but the swiddenaker has chosen to mount a swivel on every stock
Short quarterdeck, originally not reaching the mizzen mast. No steering wheel visible (in early ships it was on the upper deck abaft the mizzen, underneath the overhang of the quarterdeck)
Light spritsail bulge inboard of gallery
Largely open upper deck; number of gunports not specified but usually eleven a side (established armament was twenty 6-pdrs, 7ft 6in, 18cwt). Very light topsides, were ships having open rails above the sheer rail. Design freeboard to gunport sills was 7ft 6in
A ballast port amidships; smaller than a gunport, it was used as a loading port (though ballast was the most troublesome, which gave the port its usual name). The designed freeboard of ballast port and ear ports amidships was 2ft 7in from the waterline
Eighteen ear ports a side for long sweeps. The number remained fixed by establishment from 1719 to 1745, but the disposition was sometimes 9 each side of the ballast port and sometimes 8s 10
Standing fish figurehead
Recital bow built up to the level of a very light forecastle deck. Note the 'filletts' of the round bow (Bk. Dews) above the headrails
Lower deck, to work cables and pumps, and to berth the crew

1719 Establishment modified in 1733 and 1741

Hitherto cruiser design had been forged in war, but the 1719 ships were shaped by peace. That is not to say there was no action at sea during their careers – far from it – but the Anglo-French alliance that lasted from 1716 to 1731 kept the two great maritime rivals from all-out war. The battlefleet was typically employed in a deterrent role or to exert political pressure. Substantial forces were committed to the Baltic in the years between 1715 and 1721, initially to protect Britain's vital trade (particularly in naval stores) during the Great Northern War, but later to dissuade the Russians from pressing their advantage against Sweden in an effort to restrain Peter the Great's expansionist policies. Many of the operations took place in shallow waters, where the main protagonists employed specialist inshore flotillas of oared craft, and it is very likely that this was the motivation behind the renewed interest in rowing exhibited in 1716-17 when the old Fifth Rates were rebuilt.

Elsewhere there was ongoing tension with Spain, which came to blows in 1718 (at Cape Passaro, in the greatest Royal Navy victory nobody has ever heard of) and in 1727 when Gibraltar was besieged. However, in none of these conflicts, hot or cold, was there a major campaign against commerce.

The Sixth Rates saw a lot of service in the 1720s and '30s, but it tended to be on detached and often distant operations. They were regularly assigned as 'station ships' in the Caribbean and North America, helping to stamp out the piracy that was endemic in those parts, combating smuggling, or in carrying out surveys. All of these roles tended to mean long commissions. This influenced the development of the 20-gun ships in two ways: firstly, it placed greater emphasis on the habitability of the ships than their fighting (and sometimes even their sailing) qualities; and secondly, it meant that most of them required a major rebuilding at least once in their careers. This should be kept in mind when considering the many models representing ships of this type, which display a great variety in their details.

SLR0012 A model that represents the first stage of the development of the 1719 Sixth Rates, with a lengthened quarterdeck mounting the newly introduced steering wheel prominently on it, and full quarter galleries that have grown out of the earlier badges. The waist bulwarks are still light, but the open area has been reduced to a narrow gaps between the ports.

The first obvious deviation from the 1719 Establishment specification was the extension of the very short quarterdeck, which originally did not even reach the mizzen mast. This was almost certainly driven by the need to move the steering wheel to a position which would give the helmsman better all-round vision. Originally the wheel was squeezed in between the mizzen and the cabin bulkhead under the overhang of the quarterdeck, where the man at the wheel had a very restricted view of the set of the sails and none at all of sea conditions. Models with the extended quarterdeck usually show a wheel moved up to that deck, although it may be ahead of or abaft the mizzen. Both the wheel and the helmsman were very exposed in that position and there must have been a temptation to provide some protection against the elements in the form of rails and weather cloths, and eventually more permanent bulwarks. By 1728 the Navy Board was instructing the yards to remove all unofficial additions, like heavy awning frames 'and other unnecessary encumbrances' from sloops, and this surely applied to Sixth Rates as well.

The other feature rapidly discarded was the lightweight quarter badge, which was soon replaced by a more commodious gallery, giving the captain more room and flattering his sense of importance by making his command look more a rated warship and less like a sloop. The open rails in the waist did not last long either: they were berthed-up solid to the planksheer rail. This was undoubtedly to keep as much water as possible off the decks – although the crew berthed below, breaking waves in the waist inevitably meant wet and uncomfortable conditions below, and on long deployments the health, if not the comfort, of the crew mattered. Nevertheless, it represented a little more weight and windage aloft.

SLR0226 The identity of this model is well documented: it depicts the *Dolphin,* as converted to a fireship in 1746-47 on the starboard side of the centreline, and supposedly 'as built' on the other. Compared with the design draught, the topsides of the starboard side are strikingly different, with an extended quarterdeck and a forecastle closed off by a flat beakhead bulkhead instead of the round bow built up to the level of that deck. These are features of the later Establishments, which were probably incorporated into the older ships when refitted. However, the oddest feature is one lower deck gunport just aft of the main channel; this was not standard for either 1733 or 1741 ships. *Dolphin* operated briefly as a storeship just before conversion to a fireship, so the port may have been cut to facilitate this role, but as there is real doubt about the armament carried by these ships, it may equally have been intended for a gun. It is known that *Sheerness, Kennington* and *Tartar* carried the new 9pdrs specified in the 1733 proposals, so they may also have tested the feasibility of a proper gunport on the lower deck.

Despite these minor accretions, the 20-gun ship remained basically unchanged for a decade, but in 1730 two ships were ordered to be built with the beam increased by over 2ft from the established dimension. There is a model with the increased beam [SLR0437] that otherwise conforms to the main features of the 1719 ships, which may have been the original intention for the new pair, *Sheerness* and *Dolphin,* but there is evidence that they did not look like this in service [see SLR0226]. This broadening was one of the first signs of dissatisfaction with the 1719 Establishment that would eventually lead to the proposed revisions of 1733. These universally added breadth to all rates, perhaps suggesting a concern with the stability of British ships; but there was a more influential factor at work, and that was the desire for a substantial increase in firepower; heavier guns, of course, would require a broader beam. In parallel with the Navy Board's deliberations about dimensions, the Board of Ordnance was working out a revised establishment of guns, which if adopted would mean a substantial increase in the broadsides of most rates but at the expense of greater weight of metal on most decks. For

Sixth Rates the increase was to be huge: twenty 6pdrs of 18cwt (totalling 360cwt or 18 tons) were to be replaced by twenty-two 9pdrs of 24cwt and two 7cwt 3pdrs, aggregating 542cwt, or 27.1 tons – an increase of 50 per cent.

SLR0437 This model has a broader beam than the standard 1719 20-gun ships and probably represents the original intentions for the *Dolphin* and *Sheerness* of 1730. It agrees very closely with the design draught for the former, which in most respects follows the earlier ships in both layout and details. The one exception is the 'round-tuck stern' that replaced the flat transom, a feature also implied (but not absolutely explicit) in the draught. There is some doubt about the fitting and armament of these experimental ships, and indeed of the two following, *Tartar* and *Kennington,* supposedly the prototypes of the 1733 revised design.

SLR0228 Comment on this model of the *Tartar* has hitherto concentrated on its contemporary canvas – thought to be the oldest surviving sails on any model – but it also manifests some interesting features in the hull, notably the absence of either sweep ports or gunports on the lower deck, which would be expected of the 'prototype 1733 24-gun ship', as it is often considered. The model does show one innovation of 1733, a beakhead bulkhead, but not another, the round-tuck stern. The quality of the workmanship is not quite first class, and it may be that the modelmaker omitted the sweep ports because they are almost invisible when closed; on the other hand, having included the ballast port, there would be no reason to ignore any gunports, which were usually more prominent. There is no surviving draught to consult, but it seems likely that both this ship and the *Kennington* (ordered at the same time) were anomalous. Officially, the latter was built to a draught by the Duke of Cumberland, the 14-year-old son of the King, but since his tutor was Sir Jacob Acworth, the Surveyor of the Navy, it is easy to guess who really designed the ship. However, despite the question marks, the *Tartar* model includes many revealing details about the actual fittings of these ships, including the stanchions and man-ropes around the quarterdeck.

Neither the ship nor the gun establishments of 1733-34 were officially adopted, but they formed the guidelines for future construction. For Sixth Rates this meant a major transformation. Although they had enough ports for all the 9pdrs, the aftermost was in the captain's cabin and usually contained nothing more warlike than a casement window, so in a return to the practice of the 1690s one pair of guns was allocated to the lower deck. A gunport for this purpose was added abaft the mainmast but, curiously, there was a second right aft in the gunroom; the smaller ballast port was retained amidships along with the standard eighteen sweep ports. The function of the second gunport

was a mystery even to the shipwrights in charge of construction, so the Surveyor, Sir Jacob Acworth, was forced to explain that only the foremost port was designed for a gun; the other was 'to be used occasionally – it being extremely improper to carry a gun there, not only on account of the tiller but it being far aft and in the wake of the cabins'. By the time Acworth wrote this in 1742, the issue was a dead-letter: a new and more radical revision was introduced in 1741, when the pair of gunports on the lower deck were moved close together so either could be used for a gun.

The impetus to revise the establishment came from the final flaring of open war with Spain in 1739 following decades of low-intensity conflict between British traders and Spanish *guarda-costas* in the Caribbean. Much of this activity was outside the rule of law – smuggling and illicit trade on one side, dubiously sanctioned revenue protection on the other – and all characterised by the arbitrary use of force. The *guarda-costas* were effectively privateers, sometimes licensed but rarely restrained, and when one of them cut off the ear of Captain Robert Jenkins, an 'innocent' British trader, it was only one of many minor atrocities regularly perpetrated. Although this severed appendage did not cause the war, it became a potent symbol for its advocates, so it is appropriate that the conflict was called, then and since, the War of Jenkins' Ear.

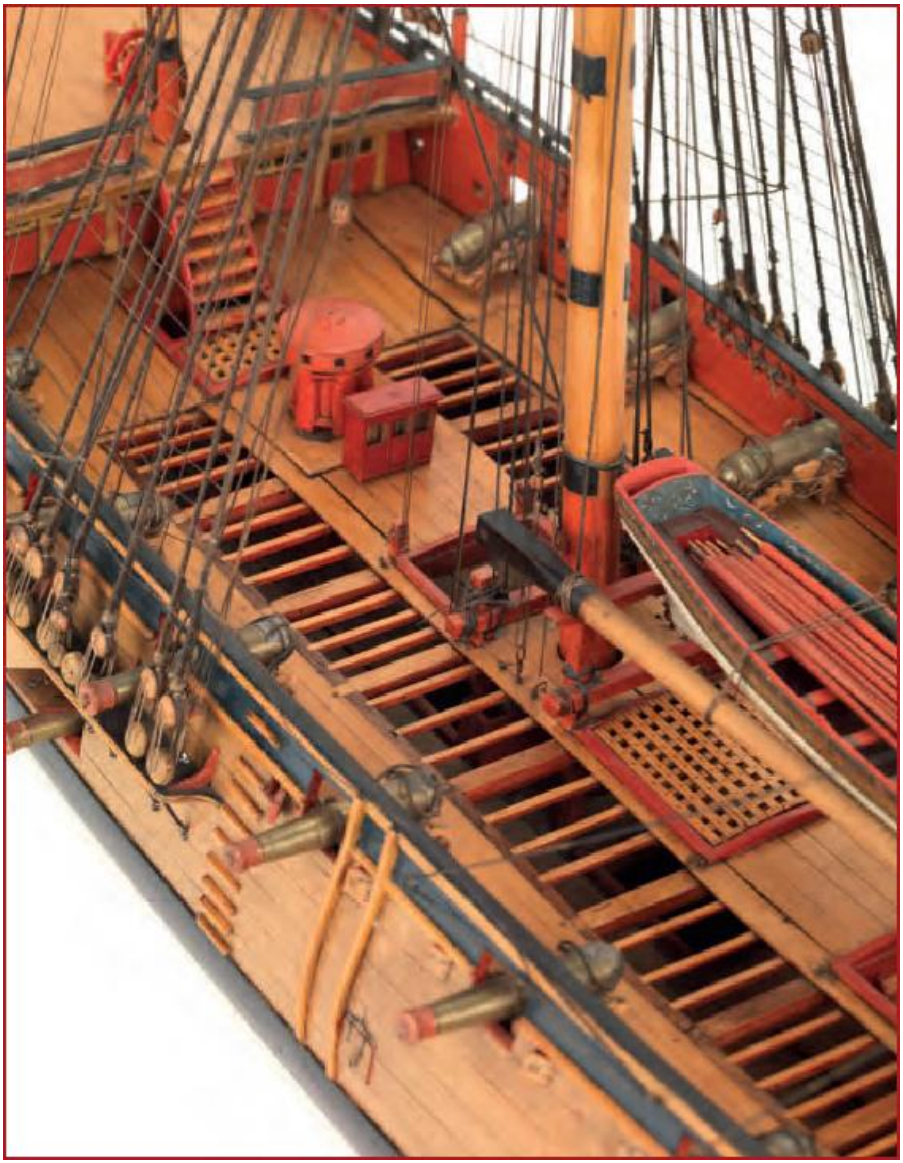
SLR0461 The 24-gun ships of the 1741 dimensions were built in a single programme of fifteen ships in response to the war with Spain. They were all constructed in private yards to a common draught provided by the Surveyor of the Navy, so should have been as nearly identical as the technology of the time allowed. This model accords closely with surviving draughts of these ships, which were superficially very similar to the 1733 ships, with the same round-tuck stern, more height under the forecastle and the flat beakhead bulkhead introduced with the earlier proposals. The most obvious difference was the disposition of the lower deck ports, the aftermost port of the 1733 ships being brought

much nearer its partner. More difficult to gauge in a model is the increase in size, which was effectively a scaling up from the previous design, although they were made slightly longer in proportion to breadth (the ratio increased from about 3.47 to exactly 3.5).

Its supporters, harkening back to the days of Drake and Hawkins, envisaged a trade war against a decadent but rich Hispanic empire, ending in massive commercial concessions on the part of the defeated Spaniards. There was a trade war – but in its first two years the ratio of merchant ships captured was three-to-two in favour of the Spanish. This of course led to a reconsideration of convoys and cruisers, and the design of the ships that performed these roles. In truth, after a generation without all-out war, the Navy's whole order of battle needed rethinking, and the proposed

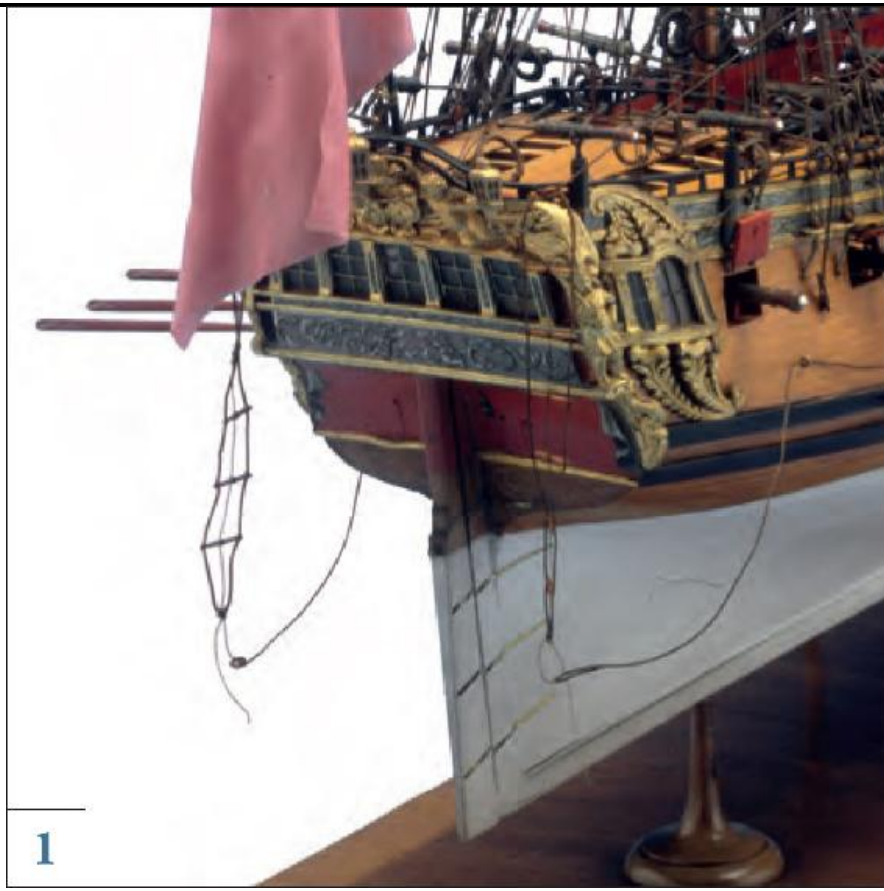
establishment of 1741 certainly increased the sizes of most rates.

In wartime one might expect enhanced sailing qualities to be a priority for cruisers, but although the 1741 ships were significantly increased in size (from 106ft to 112ft on the gundeck, 430 to 498 tons), the main developments added to their upperworks. The quarterdeck was now a fighting deck with carriage guns and swivel stocks mounted on it, protected by more substantial rails (no doubt unofficially berthed-up when action was in prospect); the forecastle went the same way, while the flat beakhead bulkhead could be an impediment in a head sea. None of these features would have improved their speed or weatherliness, but Spanish ships were not renowned for their sailing, so perhaps it was not an issue. However, this was to change dramatically when the French entered the war in 1744.



SLR0476 This impressively detailed model with its finely rendered rigging has most of the features of a 1741 ship, except that the oar ports have been moved to the upper deck, which was one of the changes contemplated by the 1745 Establishment. The 24-gun ships of the new dimensions were based on the *Garland,* a lengthened version of the 1741 design being built at Sheerness Dockyard while the Norris committee deliberated about the new establishment. The construction of *Garland* was strung out across four years, over time the ship gradually adopting the features that came to mark out the 1745 ships – a longer quarterdeck, the fore and main channels moved above the upper deck ports, and the oar ports transferred to the upper deck. This last was a matter of debate and indecision, as there are draughts relating to the 1745 Establishment showing the oar ports on either deck, and in many cases on both. None of the draughts shows the exact configuration of this model, but nevertheless it reflects that uncertainty: note there are no oar scuttles above the fore and main channels – sweeps here would have been difficult to employ without fouling the shrouds – so an uninterrupted array of oar ports would have to wait until the channels were raised.

DEVELOPMENT OF THE STERN IN ESTABLISHMENT SIXTH RATES



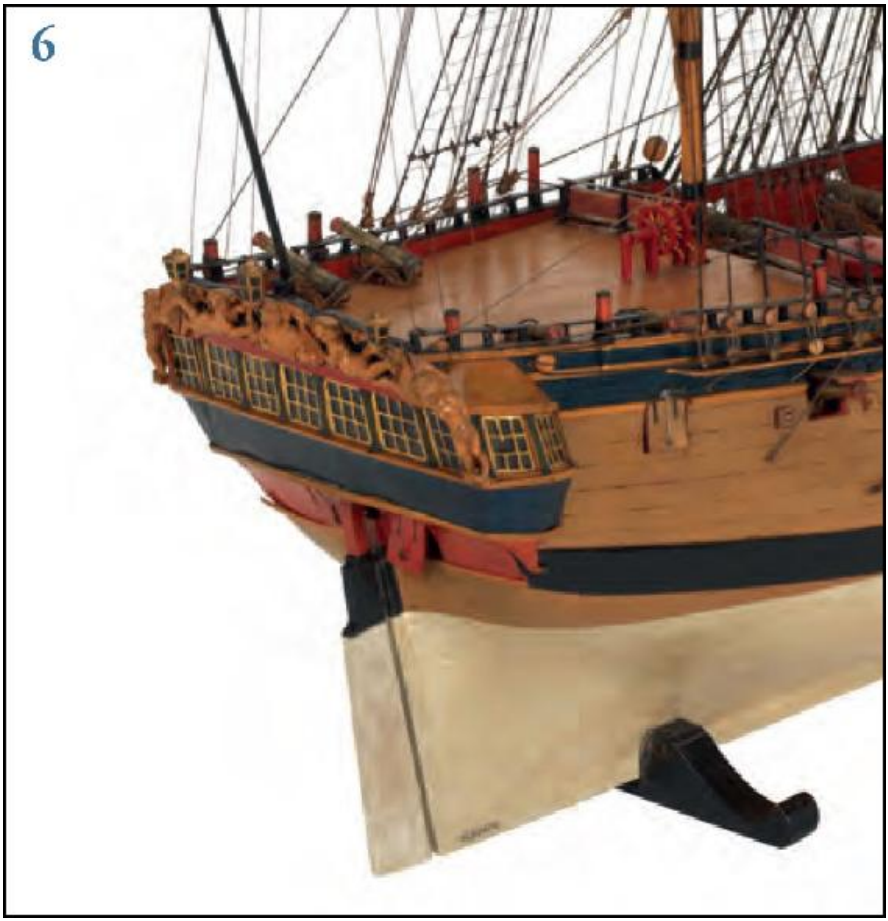
SLR0411 Despite the fact that the scantlings list for the 1719 Establishment provided for a round-tuck stern, the evidence of both models and draughts points to most, if not all, of the ships built under these provisions having a flat transom – the so-called square tuck. Quarter galleries were omitted in favour of light quarter badges, as seen here. It is very unlikely that any of the full-size ships were as highly decorated as this model, but modelmakers always like to make their artefacts as attractive as possible.

SLR0012 The prohibition on quarter galleries did not survive long, and the later 1719 ships had more elaborate stern works, like those so exquisitely depicted in this model. This pattern of seven round-topped lights with an enlarged central one is very similar to that shown on the draught of the *Lowestoffe* of 1723. The planking of the transom is very clear, and was much easier to construct than the framing of a round stern. In theory, the round stern made for a smoother run of water to the rudder, making ships more responsive to the helm, and this was a recognised feature of English ships from the mid-1600s; but in small ships, with very fine lines aft, it probably made minimal difference so the economy of timber in a square-tuck stern was preferred.

SLR0437 It is conceivable that the round stern made an appearance in Sixth Rates before the 1733 proposals (this model is a broadened 1719 ship), but it was the norm thereafter. This might be regarded as one step in the process that transformed sloop-like features, like quarter badges and a round bow, into those associated with bigger ships.

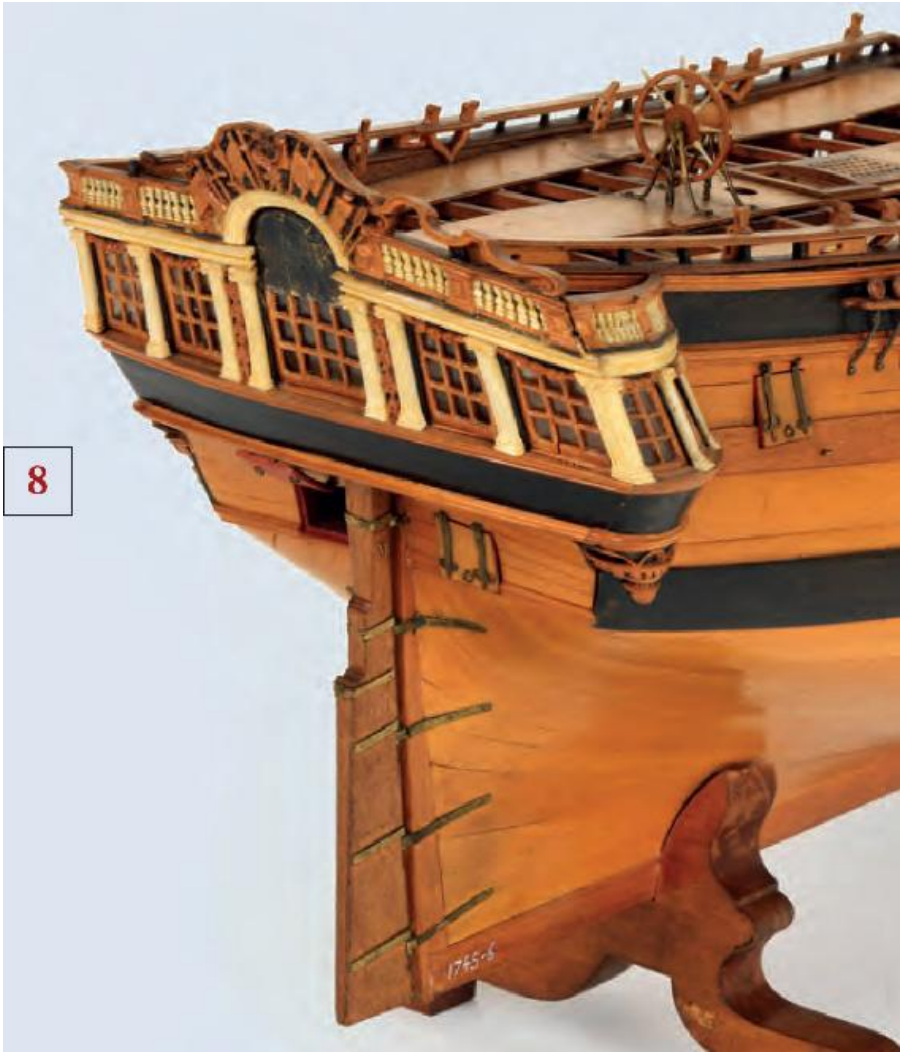
SLR0228 An exception to the rule, the model of *Tartar* (1734) retains the square tuck. There are anomalies in this model – notably the total absence of oar ports – but the ship was the prototype of the 1733 ships and no draught survives either to confirm or contradict these details.

SLR0461 On the half-battery Fifth Rates of the 1690s, the lower deck guns were of a heavier calibre, but it is not easy to see the value of a pair of guns on the lower deck of the later 24s, when they were the same as those in the main battery. One suggestion is that they could be used as stern-chasers when required, and all Establishment Sixth Rates have two ports in the upper counter; whether they could be used without fouling the tiller is open to question.



SLR0476 By the mid-1740s the 24-gun ships had an armed and barricaded quarterdeck, with 3pdr carriage guns and stocks for mounting swivels (the four shown on this model conform to the draughts). There should be only two guns on this deck, but modelmakers can rarely resist filling every port – but it does emphasise that both guns could be fought on one broadside if required.

SLR0457 Unusual among Sixth Rate models in showing no stern ports, this example also has an unorthodox shape and decoration to the stern galleries. The model does not show the usual level of craftsmanship found in official models, and it may be that both the model and its prototype originate outside the Navy.



SLR0475 The final manifestation of the Establishment Sixth Rate, a model of a 1745 ship with a large and eye-catching stern gallery.

The End of the Establishments

The naval war with France opened with a tactically drawn battle off Toulon, fought before any formal declaration, which resulted in controversy, courts-martial and a political furore. If the result was disappointing to the Navy, it incensed the public and, when combined with factors like an acute threat of invasion across the Channel, brought down the government. The new administration taking office in November 1744 produced a formidable team at the Admiralty under the Duke of Bedford that included the Earl of Sandwich

and George Anson, the current darling of the public after his epic circumnavigation and his capture of the famed Manila Galleon. These men were to fundamentally reform almost every aspect of the Navy over the next two decades, and they were quick to tackle the perceived inadequacies of the Navy's ships.

The Establishments, not only altered in 1733 and 1741 but also permitting many individual exceptions, had never produced a standardised fleet; more importantly, the system had signally failed to match the size and qualities of French and Spanish ships, as was now underlined by wartime experience. The Admiralty wanted something more radical than previous tinkering, which, they believed, would only be achieved if the proceedings were not the monopoly of the Surveyor and the Master Shipwrights. Therefore, they set up a wide-ranging committee under the chairmanship of Sir John Norris, Britain's most senior admiral, with powers to consult experienced flag officers, captains and others with practical experience at sea, as well as prominent commercial shipbuilders, and invite their comment on the new specifications proposed by the shipwrights.

Judging by their brief, the main concerns were the strength of ships and particularly their lack of stiffness under sail, which tended to submerge their lee ports, so they could not be fought in even moderate weather. Unlike the 1719 Establishment, which resulted only in a set of dimensions and a scantlings list, the new one was to include a single approved draught for each class from 100 to 24 guns. This was a major undertaking, but as far as the Sixth Rate is concerned, there is no evidence that the design was subjected to any radical rethinking.

SLR0458 This block model of the 1745 24-gun ships was presumably part of the design process, exhibiting the main features of the extended quarterdeck with the raised channels and upper deck oar ports painted on the topsides (judging by the draughts, there should be two more of these, between gunports 2 and 3). The block model shows off the fine lines of both the entrance and the run in the underwater body – it was not the lines, but the height of topside that compromised the sailing of these ships, making them relatively leewardly and lacking stiffness (the gunports had more than enough freeboard, but it was difficult to fight the guns on a steeply heeling deck).

As had happened earlier in 1733 and 1741, the new design was based on an existing modification of the previous dimensions, and in this case the ship was the *Garland,* the last of the nominally 1741 ships and the only one to be

built in a royal dockyard. Altered a number of times during her lengthy four-year period on the stocks, the resulting ship commissioned nearly two years later than the first (merchant-built) 1745 Establishment 24-gun ship, so perhaps 'prototype' is not an entirely appropriate description, but it does seem that the 1745 alterations were worked out on the draught of this ship.

The main changes were a greatly extended quarterdeck and forecastle, and the raising of the channels above the upper deck ports. Since the shrouds would not then interfere with the operation of sweeps, this allowed the oar ports to be moved from the lower to the upper deck, although this took some time before a final decision was made (design draughts show eighteen oar ports on the lower deck, but later ones only fifteen when moved to the upper deck). The changes made the ships more 'defensible' *(ie* less easy to board) and more seaworthy, but by increasing weight and windage, it cannot have done anything for their sailing qualities.

SLR0475 An official model of the 1745 Establishment 24-gun ship. From this angle it is clear that the forecastle and quarterdeck were not only lengthened but the height under them was also increased – especially the forecastle, as evinced by the deep beakhead bulkhead. Furthermore, the waist rails were raised and topped with a broad gunwale. There are no oar ports on either deck, which may reflect the uncertainty about their final position when the model was being constructed.

SLR0461 SLR0475 The most obvious identification feature distinguishing 1741 Establishment 24s from the 1745 ships was the extended quarterdeck. This was probably the result of the desire to move the channels above the upper deck gunports – as can be seen in the top model, this would have meant a complete absence of support behind the flimsy topside planking. As these platforms spread the main shrouds (the principal lateral bracing for the main mast) and absorbed considerable stress transmitted by the standing rigging, they needed to be firmly tied in to the main ship structure. By extending the quarterdeck, the channels could benefit from the transverse beam system that supported that deck. Moving the channels up made them less vulnerable to wave damage, but it also made it possible to move the oar ports to the upper deck (although the 1745 model does not show them at all, they feature on most of the draughts). This begs the question of what advantage was expected to accrue from upper

deck oar ports, as the steeper angle imposed on the oars would have made rowing more difficult: it is pure speculation, but one possible explanation is that the Surveyors were contemplating reducing the headroom between decks, thus moving a step closer to the later ‘true frigate’ concept.

4: The ‘True Frigate’
1748-1778

The 1745 Establishment was largely about battleships. The Admiralty’s main concern in appointing the Norris committee was to improve the ships of the battlefleet, and in particular to have the much-maligned three-decker 80-gun ships superseded by what they called ‘two and a half decked ships’ – French and Spanish style 74s. A less overt agenda was to force the retirement of the aged and autocratic Surveyor, Sir Jacob Acworth, who was virtually omnipotent in matters of design. In both they failed: the committee refused to give up the 80s, and the best that could be achieved with Acworth was to appoint a professional rival, Joseph Allin, as joint Surveyor in 1747. The Admiralty lost confidence in the 1745 ships before any had entered the water, and took steps to circumvent the provisions of the new establishment before it even came into force.

The most influential critic of current ship design was Anson, who balanced his Admiralty duties with command of the new Western Squadron, which was evolving a more aggressive strategy that involved a main fleet being kept down-Channel (effectively, to windward with the prevailing westerlies) where it could protect the incoming trade and be ready to swoop on any French squadron venturing out from Brest. This required stronger and more seaworthy ships, as it was planned to keep the fleet at sea for longer and to operate in almost any weather; equally, its success depended on good intelligence of French movements, so there was a renewed emphasis on the reconnaissance role of frigates. No existing British Fifth or Sixth Rate was up to the task, and Anson’s judgement was scathing – ‘all our frigates sail wretchedly’ – but he had a radical proposal: copy a captured French ship.

SLR0457 In a little noticed move, the Admiralty first revealed their intention to undermine the Surveyor's monopoly on ship design by ordering two 24-gun ships in June 1745, when the Norris committee had barely started its work. Although following the existing dimensions, they were 'to be built according to a model left in the office by Jos. Allen, merchant shipbuilder of Deptford', the only Establishment-era ships apparently designed by a commercial builder – although there is some mystery about his identity. Josiah Allen or Allin (both spellings occur in official correspondence) was Master Shipwright at Deptford and about to be appointed joint Surveyor, but he had a son of the same name who had trained as a shipwright and may have been in business as a shipbuilder. The ships became *Centaur* and *Deal Castle,* and they may originally have been intended to have no guns (or any ports) on the lower deck, although they did have a lengthened quarterdeck. This model, which is clearly not made to the same standard as official Navy craftsmen could achieve, is a close match to the dimensions and principal features, but there were a number of proposals for ships without lower deck gunports around this time.

The notion of British ships built to the lines of French prizes was to become very familiar, so it is difficult to appreciate that at the time it was completely unprecedented. It was indeed a revolutionary idea, but Anson wanted a revolutionary ship, and he knew he would never get one through official channels. However, his initiative was carefully considered, the combined product of extensive private correspondence with some of the more forward-thinking shipwrights and his personal experience of the performance of captured French cruisers in his fleet. These were longer, lower and more lightly built than anything in the Royal Navy and British naval officers were greatly impressed by their speed and weatherliness.

Although its significance only became evident in retrospect, French designers had achieved an important advance by a subtle alteration in the layout of 'two-decked' cruisers. British 24s had a heavily framed full-height lower deck, necessary to fight the guns and to allow rowing with standing oarsmen; the position of the deck itself was determined by the need for a safe freeboard to the ports. By contrast, in the latest French ships the lower deck was little more than a light platform, with much reduced headroom, and the deck itself, at its lowest point, positioned just below the waterline. This compressed the height of the topside, while the forecastle and quarterdeck were unarmed and had virtually no barricades or rails to catch the wind; combined with fine lines and light framing, this made for fast and weatherly ships. Credit for this innovation goes to Blaise Ollivier, the constructor at

Brest, and was first applied in 1741 to the *Medée* of twenty-six 8pdrs. This formula was eventually adopted by all the major navies, and was dubbed the 'true frigate' form, in retrospect, by naval historians.

Four of the first eight such ships were captured during the war, and the largest of them, the 746-ton *Ambuscade,* soon established a fine reputation with Anson's fleet. However, the ship Anson proposed to copy was not a national frigate, but a privateer called the *Tygre,* at 576 tons closer to the 24-gun ships he wanted to replace. Acting on the advice of Benjamin Slade, the Master Shipwright at Plymouth, he chose this ship because 'she has a great character [*ie* reputation] for sailing' and although the Admiralty decided against purchasing the *Tygre* herself, they instructed Slade to take off the lines 'in the most exact manner' and 'have a perfect draught drawn thereof, and to take an exact account of all the scantlings, dimensions, form and manner of framing, scarphs, fastenings and every particular relating to her hull, masts and yards'. Then on 29 April 1747 two new 24-gun ships were ordered to be built 'without the least deviation' from this draught, one at Deptford and one by Slade himself at Plymouth, such being the priority that they were to be 'carried on in preference to all other new works'.

Both launched in December 1748, they became *Unicorn* (Plymouth) and *Lyme* (Deptford). Carrying only twenty-four 9pdrs on the upper deck, they were the first British ships of this new frigate form.

Although many external features of this model seem unfinished – most noticeably an uncarved block figurehead – the internal fittings are quite detailed, and include pump handles rigged for both chain- and elmtree-pumps just forward of the break of the quarterdeck, and a galley stove and chimney under the forecastle. Note the oar port lids unusually hinged from the top.

SLR0509 The *Unicorn* and *Lyme* were a great success, and eventually twenty ships were built to this design during the next war, including five experimentally built of softwood. This model depicts one of the last, the *Guadeloupe,* ordered in 1757 but not launched until 1763 as a consequence of her builder's bankruptcy and the transfer of the order to a royal dockyard. The prototype pair followed their French model quite closely, but proved too cramped internally for RN purposes, so the second pair were modified to add about a foot of headroom between decks – ironically, as this was one of the features that had made the French formula so attractive in the first place – but it meant better conditions for the men berthed on the lower deck, and increased the main battery freeboard from its barely adequate 5ft. For the follow-on ships, it was planned to work their cables on the lower deck, as they had double capstans, but it was found impractical in ships with a lower deck that dipped below the waterline amidships, so they were all eventually fitted as shown in the *Guadeloupe* model. From 1756 they were allocated four 3pdrs on the quarterdeck to add to the twenty-four 9s on the upper deck, and in so doing introduced the new rating of 28-gun ship.

DEVELOPMENT OF THE HEAD

SLR0005 The traditional way of closing off the forward end of the forecastle was to erect a flat panel, called the beakhead bulkhead a short distance from the stemhead, leaving a small platform ahead of it. This was the customary site of the 'seats of easement' for the crew and ever since 'the head' has become synonymous with lavatory in sailors' parlance. The beakhead platform was also useful in handling the headsails, and the flat bulkhead made it easy to cut ports for bow-chase guns to fire directly forward over the headrails (careful inspection of this model of a Fourth Rate of about 1685 will reveal a closed gunport just above the platform, with a larger hatch for access next to it). Two-deckers worked their cables on the lower deck, and the twin hawse holes for the anchor cables can be seen between the second and third headrail.

SLR0393 A beakhead bulkhead was difficult to contrive in single-deck ships because they could only work their cables on the upper deck so the hawse holes had to give access to that deck. As shown in this 20-gun ship dated 1706, one compromise was to carry the framing of the bow half way up the height of the forecastle – enough to give room for the hawse holes – and have the beakhead platform backed by a short bulkhead.

SLR0397 By about 1710 the bow framing was being carried up to the level of the forecastle deck, the bulkhead in effect forming a barricade above rather than below the forecastle. Apart from being simpler to construct, one advantage of the flat bulkhead was the ease of securing chase guns to fire over it. The head still performed its traditional role – on this model the starboard seat can be seen under the bowsprit, although the portside one has broken off (there is an unpainted section of the bulkhead where it once fitted).

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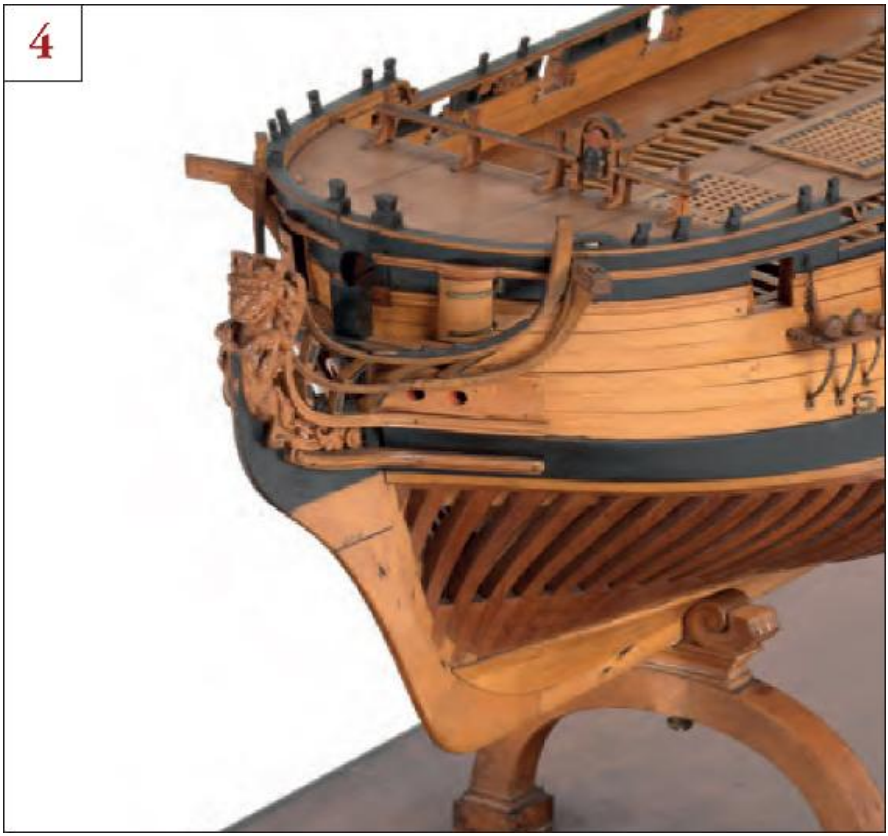
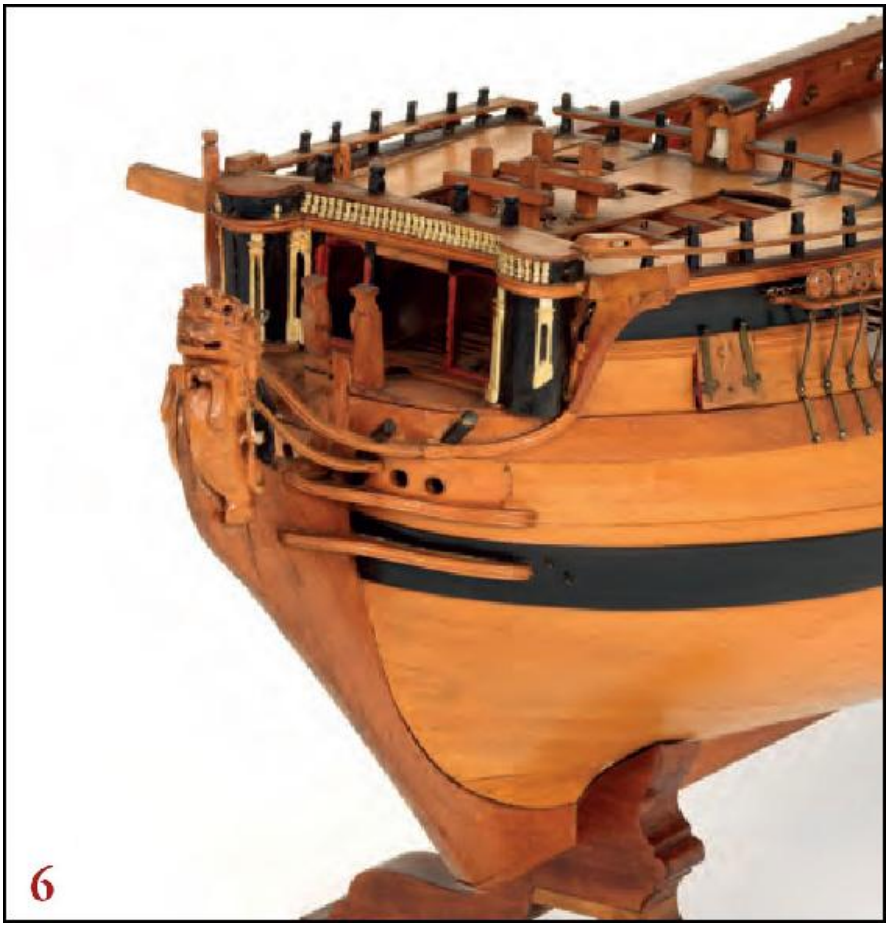
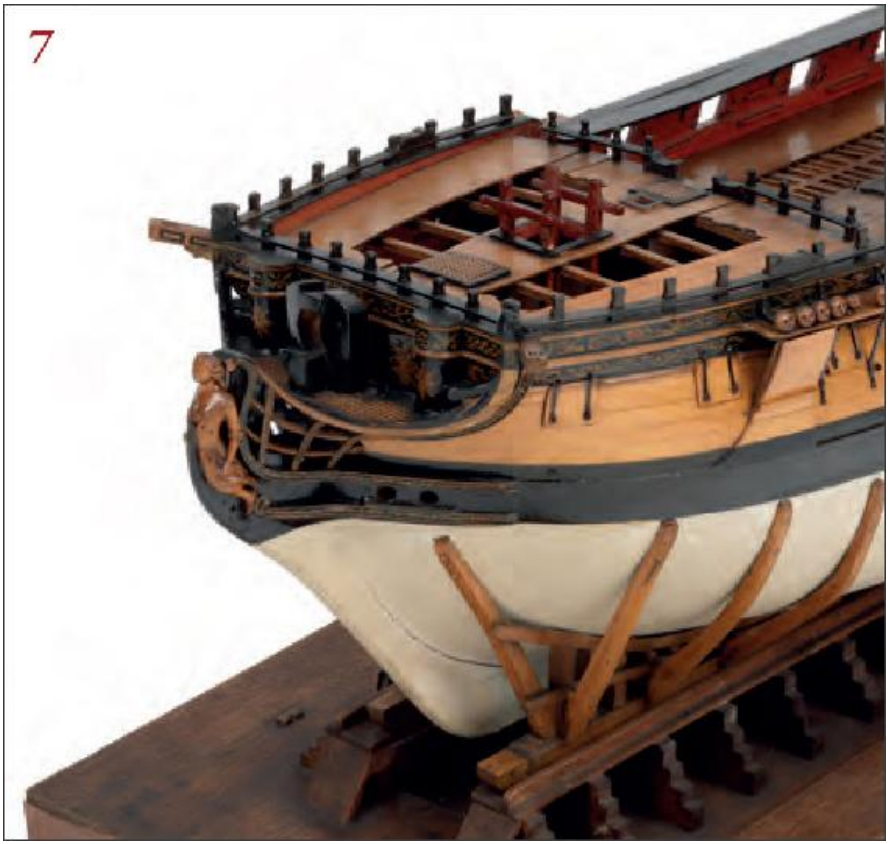


SLR0012 Although the 1719 Establishment 20s worked their cables on the lower deck, they gave up the beakhead bulkhead completely, preferring what came to be called the round bow, built up to the top of the forecastle. This was the usual pattern in sloops and small ships, and was preferred because it made the bows stronger and generated less resistance when butting into a head sea. There was a tiny grating platform over the headrails but the lavatory facilities were now enclosed in two ‘roundhouses’, whose curved doors bulge out of the bow timbering.

SLR0461 The beakhead bulkhead staged a return with the 1733 and 1741 ships, in which the forecastle became a structural deck and not just a platform (the increased height under it is apparent from the depth of the bulkhead). The roundhouses were retained, now flanked by two doors giving access to the beakhead platform.



SLR0475 The doors and panelling between the roundhouses have disappeared from this model, but it serves to emphasise the height beneath the forecastle in 1745 ships, and the flimsy nature of the bulkhead's resistance to raking fire from forward.



SLR0496 With the exception of the *Unicorn,* which had a beakhead bulkhead, all the new 28s had round bows, even when it was planned to work their cables on the lower deck. The first 12pdr ships, like this *Richmond* class 32, all reverted to the beakhead, perhaps encouraged by the fact that they did work their cables on the lower deck.

SLR0339 The second generation of 12pdr ships moved their cable-handling to the upper deck and adopted the round bow. Thereafter no British frigate was built with a beakhead bulkhead (even the *Richmond* class design when revived in 1804 was built with a round bow). This fine model of the 32-gun *Winchelsea* of 1761 demonstrates the structural advantage of the round bow – framing carried up to the top of the forecastle that was as solid as that on the broadside.

The First 12-pounder Frigates

The *Unicorn* and *Lyme* set a number of important administrative precedents: first, that the Admiralty could depart from the Establishment if it felt the need; second, that it could determine the design (by insisting that a particular model be copied); and third, by extrapolation, that in future there would always be more than one source of design. Henceforth, there were

always to be at least two Surveyors during wartime, and when there was only a single incumbent, he was supported by a highly regarded Assistant Surveyor who was clearly seen as a full Surveyor-in-waiting. In this case, the comparative principle was honoured by allowing Acworth and Allin, the two Surveyors in post, to design their own alternatives to the French-derived pair, equally untrammelled by Establishment restrictions. Both the resulting *Seahorse* from Acworth and Allin's *Mermaid* were a conceptual halfway house between the old 24s and the new frigate form – they had no gunports on the lower deck but, having much the same headroom between decks, the height of side was not significantly reduced, and being shorter than the *Unicorn*s, they did not perform so well. When the time came to build more Sixth Rates in 1755, there was no debate about which model to chose, and two slightly modified *Unicorn*s were ordered. Now rated 28s, this type became the standard light cruiser for over two decades.

In the interim a parallel argument was developing about the Navy's heavy cruiser, the two-decker 44-gun ship. As early as 1747 the Navy Board was fending off suggestions that a frigate-form ship would be preferable, arguing – as they had in defence of the three-decker 80 – that multiple decks made them better *fighting* ships: there was more room on the gundecks to work the guns, and the crews were better protected than those on the long exposed quarterdecks and forecastles of frigates. They were prepared to admit that, being taller and more heavily built, British 44s were not such good sailers, but they denied that they could not open the lower deck ports in any sort of seaway – their lower tier could be opened in 'any fighting weather' and their battery of twenty 18pdrs was superior to the thirty 12pdrs proposed. Furthermore, as these two-deckers were often convoy escorts as well as cruisers their defensible qualities were as important as speed under sail.

SLR0496 SLR0497 While there are no known contemporary models of Slade's *Southampton* class, there are two fine depictions of Bately's *Richmonds.* Conceptually, they carried over some aspects of the two-deckers they replaced in that both classes worked their cables and pumps on a lower deck, and had flat beakhead bulkheads; they were also intended to have oar ports on the lower deck, which therefore required substantial headroom, but these were moved to the upper deck during the design phase and the ships probably completed without any. Note that neither of these models shows any oar ports, but they also omit the small scuttles (for light and air) the ships are known to have retained on the lower deck. Bately's ships were easily recognised by an extra (fourteenth) gunport on the broadside forward, but they also featured a very characteristic hull shape, aptly described by the eminent American historian Howard Chapelle as 'scow-like'. This Bately 'borrowed' from the yacht *Royal Caroline,* a hull form that could be traced all the way back to Lord Danby's *Peregrine Galley* of 1700.

As so often, France took the lead by building the *Hermione,* the first 12pdr frigate, in 1748, and thereafter no more French two-decker 40s were ordered. However, there was clearly a degree of uncertainty about the ideal size, armament, and even design features, of the new type. The first ship, measuring 811 tons by British calculation, had an unusually deep hull, with six ports on the lower deck when captured in 1758 (although none was armed; the ship may have been built with oar ports on this deck) and a main battery of twenty-six 12pdrs. The next ship was rather smaller with only twenty-four guns, while the two after that were far larger and carried thirty 12pdrs. There was never to be a remotely standard French 12pdr frigate, although a typical ship would measure about 900 tons and carry twenty-six 12pdrs and six 6pdrs on the quarterdeck.

SLR0339 The *Niger* class was a notable improvement over the first two 32-gun designs, but the principal advantage was in the hull form, which is not easy to appreciate in this model of *Winchelsea.* What is more obvious is the hawse brought in on the upper deck, with a round bow and a lighter and more raised head as a consequence. Although there are still only thirteen broadside gunports, there is a chase port right forward, presumably to replace a position firing over the beakhead bulkhead. One minor problem with the round bow was that the catbeam (connecting and supporting the catheads that had been fitted across the top of the beakhead bulkhead) had to be replaced by angled extensions run under the forecastle beams so they did not obstruct the deck. Apart from the carriage guns, these ships were issued with twelve ½pdr swivel guns, and their stocks can be seen above gunports 1, 3, 12 and 13; they could also be fitted in the fighting tops.

By contrast the Royal Navy knew exactly what it wanted from its first 12pdr frigates, the specification being ships of about 650 tons and a battery of twenty-six 12pdrs; the dimensions did not vary by more than about 10 per cent during the three decades such ships were built. The disparity in size was partly the product of the typical British policy of building the smallest viable unit (so the maximum number could be built for any given budget), but in any case the true comparison is not with the handful of 12pdr ships France built before 1764 but the substantial numbers of large but 8pdr-armed frigates that formed the core of the French frigate force during the Seven Years War.

By 1755 both Acworth and Allin were dead and had been replaced by joint Surveyors of a far younger generation in Thomas Slade and William Bately. Following the new comparative policy, each was set to produce a draught to the same general specification for a 32-gun ship of about 125ft on the gundeck. Bately, a competent but unoriginal thinker, produced a slightly longer, narrower and shallower hull form based on a long-established fast-sailing tradition preserved in the yacht *Royal Caroline* but ultimately derived from Lord Danby's work at the beginning of the century. His *Richmond* was a modest success, despite not being as fast as expected, and six ships were built to this draught during the war; astonishingly, the design was revived in 1804 for a further eight ships when it was decidedly obsolescent, although it has to be said that at the time a small, cheap design was politically expedient.

Slade, who by both contemporary and historical judgement was to become the best British ship designer of the century, did not excel with his first frigate class. Apparently a genuinely *ab initio* design based on no existing model, the *Southampton* class were strong, good sea-boats and performed well in heavy weather, but lacked speed. However, Slade's most notable characteristic as a

designer was a constant search for improvement, a self-critical faculty manifest in the many alterations to be found on his draughts. Often the advance was incremental – as seen in the many variants on his standard 74-gun ship classes – but in this case he took an entirely different starting point, developing the lines from the *Tygre*-derived 28s for the next class. As alternatives, he had offered the Admiralty an improved *Southampton* or a hull based on the extreme French form of the *Amazon,* the 20-gun *Panthère* captured in 1746, but as he was called to the Admiralty to discuss the options, it is highly likely that the final decision was largely based on his own preference. It was a good choice: the resulting *Niger* design provided the best British 12pdr class and, in terms of fitness for purpose, probably the best frigates of the Seven Years War. They were fast, weatherly, very handy and strongly built; more of them (eleven) were ordered than any other design, and it is entirely appropriate that when Lord Sandwich commissioned a spectacular structural model he chose one of these to be the subject. The *Winchelsea* model [SLR0339], complete on the starboard side but with the port side unplanked to reveal how such ships were built, was presented to George III in 1774 as part of Sandwich's campaign to interest the King in his navy.

SLR0501 The block model of Slade's *Phoenix* suggests that he planned to abolish the usual roundhouse on the quarterdeck of 44s in order to cut down windage. The stern also looks narrow but the absence of quarter galleries cannot be taken as proof that none were intended as block models were very utilitarian working tools – mainly concerned to show the lines and general layout – and the level of detail painted on them varied a lot. When this design was revived during the American Revolutionary War the ships were broadened by over a foot so *Phoenix*'s stability was probably less than ideal. The revived design also omitted the roundhouse, although some early ships of the class had a second, false, set of stern and quarter gallery lights.

All the demands that were to be placed on heavier frigates during the war were met, and with total satisfaction, by the 12pdr 32; but before this became clear there were a couple of trials with more powerful ships. In July 1756 three enlarged *Southampton*s were ordered as the *Pallas* class and rated as 36-gun ships. At around 720 tons, they were about 11 per cent larger (and because costs were calculated on a £ per ton basis, more expensive pro rata) yet they offered only four extra 6pdrs by way of firepower benefit over the standard 32. No more 12pdr 36s were ever ordered.

More radical was an attempt to find out if Slade could make an acceptable cruiser out of the two-decker 44, the single example being launched as the *Phoenix* in 1759. Longer and narrower than its 1745 Establishment predecessors, this ship was the only 44 built during the Seven Years War, so even the advantage of an 18pdr main battery was not considered valuable at this time.

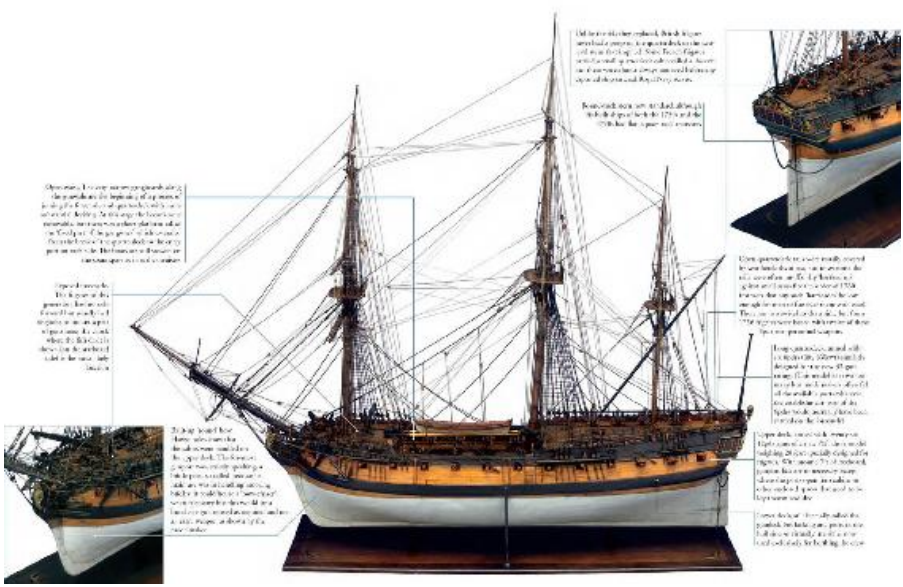
By 1757 Slade enjoyed the complete confidence of the Admiralty and was allowed considerable autonomy over ship design, totally eclipsing Bately in the process. He was permitted to build a frigate on extreme French principles – 'stretching' the *Tygre* hull form by 10ft and using very lightweight framing – and the resulting 32-gun *Tweed* showed all the advantages and disadvantages of the French philosophy: she was fast, very wet, tender (lacking stability) and short-lived. It was almost as though Slade was providing his masters at the Admiralty with an object lesson in how to prioritise their requirements.

Slade's final contributions to frigate design had a curious provenance. In 1757 the Navy had captured a very large 950-ton 'frigate' constructed in Quebec. Everything about this ship was strange – including her name, *L'Abenakise,* which the English tried to render as *Bon Acquis* or *Bien Acquis,* although she actually celebrated the Abenaki tribe, one of the principal Indian allies of French Canada. The ship herself, though new-built, was a *demi-batterie* ship, like the purpose-designed commerce-raiders of half a century earlier, with eight 18pdrs on the lower deck and twenty-eight 12s above. Despite the anachronistic layout, Slade inspected the ship and, 'approving very much of the form of her body', suggested that she would provide the model for an improved frigate design. Slade's enthusiasm was so infectious that the Admiralty ordered draughts prepared for five new classes, from a 74 to a sloop. This required a further lesson for Their Lordships on the difficulty of simply scaling a set of lines up or down, but the resulting designs utilised the principles of the French form and were described as 'nearly similar to the *Aurora',* as the prize had been renamed.

Both new frigate designs, the 28-gun *Mermaid* and the 32-gun *Lowestoffe* were slightly larger than existing ships but not the radical improvement Slade had hoped for.

THE FRIGATE ABOUT 1760

This highly detailed model of the *Lowestoffe,* launched in 1761, represents Sir Thomas Slade's final thoughts on the 12pdr 32-gun frigate. The hull form was developed from that of a French prize, the more upright stem and sternpost being obvious features, but the midship section is more difficult to appreciate in a photograph. The French employed a characteristic transverse shape with sharp angles at the ends of the floors and around the load waterline, combined with excessive tumblehome (the curving in of the topsides), but it is notable that the British avoided the extreme versions of this 'two-turn bilge', preferring more rounded versions with less tumblehome. In *Lowestoffe* Slade produced a very fast ship, but she was only a slight improvement over his already excellent *Niger* class.



Continuity and Conservatism, 1771-1778

Slade died in 1771 leaving an impressive body of work – outstanding frigates, continuously improved 74s and the immortal *Victory,* the finest First Rate of the century – but, more significantly, a daunting reputation. Sir John

Henslow, one of his followers and himself a Surveyor in the 1790s, summed up the view among his contemporaries: 'My late very esteemed friend and patron, Sir Thomas Slade, he was truly a great man in the line he took, such a one I believe never went before him, and if I am not too partial, I may venture to say will hardly follow him.' His successors certainly trod softly in the shadow of the great man.

Cruiser building had lapsed with the peace of 1763, but the threat of war with Spain in 1770 prompted a small programme of frigate construction. Alongside a few additions to Slade's 32-gun *Lowestoffe* and 28-gun *Mermaid* classes, the new Surveyor, John Williams, produced his own designs for both rates. These set the precedent for his very conservative approach, although this was underpinned by the general satisfaction with existing dimensions, proportions and specifications. His resulting *Amazon* class 32s and *Enterprize* class 28s were almost clones of the earlier *Niger* and *Unicorn* classes, except that relatively minor changes to the lines of both classes actually degraded their performance under sail.

As tensions with Britain's north American colonists escalated into rebellion, the Admiralty's response was considered: six more 28s to Williams' *Enterprize* design were ordered in 1776 and a further nine over the next two years, but no 32s. Instead, there was an apparently surprising return to the two-decker 44, built to a design derived from Slade's *Phoenix* via a slightly modified one-off, the *Roebuck* of 1769. This was not a failure of belief in the frigate form, but a conscious response to the requirements of 'littoral warfare' as it is called these days. The colonies had no navy to speak of, and 28s could deal with the largest privateers, but the amphibious and shore bombardment missions characteristic of this war required ships of relatively shallow draught but heavy batteries – with 18pdrs on the lower deck, the 44s fulfilled this need perfectly, and nineteen of them were built during the conflict.

SLR0315 This model is usually catalogued as *Amazon* (an identity given credence by the figurehead). It certainly shows a remarkable correspondence with the design draught for Williams' new class, right down to the shape of the rails, and the precise positions of swivel stocks and timberheads. However, it only relates to the first three ordered in 1770-1, as the later ships of 1778 and beyond differed in a number of minor topside details. One intriguing variation from the draught is the model's inclusion of a bridle port, a feature that seems to have died out completely in post-Slade frigates, only reappearing in the mid-1790s. Note the narrow gangways, fitted below the level of the forecastle and quarterdeck, with

their hammock netting cranes; these iron double stanchions normally supported netting into which the tightly rolled hammocks of the crew were stowed, providing limited protection against small-arms fire in battle. There are also four iron yokes for swivel guns on each gangway.

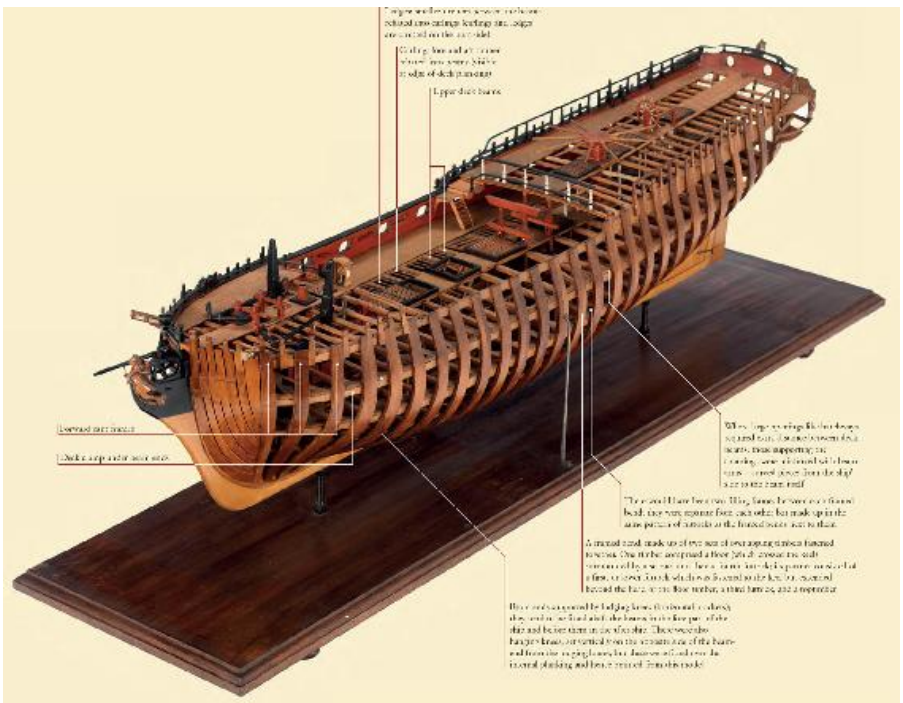
As soon as France actively entered the war in 1778, the Navy began building 32s again, emphasising that the 12pdr frigate was primarily intended for fleet and oceanic trade war roles. Alongside a revival of Williams' *Amazon* class, there was to be a design by the younger joint Surveyor Edward Hunt. He had a reputation for being more adventurous than his senior colleague, but he was constrained to follow the same parameters as earlier 32-gun designs, and his resulting *Active* class was generally regarded as disappointing. Hunt then produced a lengthened version in 1780, six of which were built as the *Andromeda* class. This was to be the last entirely new design for 12pdr frigates produced for the Royal Navy. The new war demanded more powerful ships.

SLR0318 *Mermaid,* the last of Hunt's *Active* class 32s to commission, shown ready for launching in November 1784. The completion of the ship was much delayed by the transfer of the order to Sheerness after three years nominally under construction at Woolwich. The model demonstrates one of the developments of the American War period, the raising of the waist rails combined with the addition of wider gangways fitted flush with the forecastle and quarterdeck. As in Williams' designs, there is no bridle port.

STRUCTURE

As a shipbuilding material, wood suffered from two major drawbacks of its organic nature: it was only available in limited dimensions, and it was subject to natural decay over time. These two factors determined the way wooden vessels were built. Ships were necessarily made up of many relatively small pieces, which placed great importance on the way they were put together – the methods of fastening – and the quality of those individual parts. The structural design was essentially a transverse system whose principal strength members were the large athwartship timbers loosely known as frames. Relatively speaking, wooden ships were longitudinally weak and therefore vulnerable to stresses set up by the action of wind and wave on the hull, which because of its fine ends possessed far less buoyancy fore and aft than amid-ships. This led to a condition known as 'hogging' in which the hull arched upwards, 'breaking the sheer' in the contemporary expression, opening up seams and forcing out the caulking that made the hull watertight. The gradual loosening of the hull's integrity let in water, accelerated decay and degraded the performance of the ship itself.

Minimising this problem was a major concern for shipwrights, and there were various approaches open to them: increasing the scantlings (a term that encompassed both the breadth and thickness of the timbers); employing more elaborate fastenings; or optimising the hull design for greater strength. The first, which generally meant more substantial frames with less space between them, resulted in heavier and therefore slower hulls, so was not entirely appropriate for frigates (although British ships were generally more heavily built than those of their enemies). The second was something to which the British paid special attention, so that beam-ends, for example, were secured by both hanging and lodging knees, and ever more complex schemes of fastening were applied throughout the structure; this was costly in both labour and materials, but in the British view repaid by more durable hulls. The third was more subtle, in that the British preference for shorter, deeper hulls naturally endowed them with greater girder strength, despite the downside of potentially slower speed.



Hull Construction

SLR0339 Most scale models are content to represent in miniature the external shape and features of its subject, and even the appearance may be idealised to make a more presentable artefact. As such they are rarely concerned to replicate full-size practice, but this model of the *Winchelsea* (1764) is a magnificent exception. Commissioned as part of Lord Sandwich's campaign to promote King George III's interest in his navy, it was intended to demonstrate the main features of a 32-gun frigate as then built. On the starboard side it conforms to the usual conventions of official models, but the port side is contrived to reveal much of the structure and internal works. The main frames (technically, 'framed bends') are

modelled in their proper paired arrangement of overlapping floors, futtocks and toptimbers (with the heads of the individual timbers scribed on), but the intervening filler frames are omitted to allow the interior to be viewed. The intricate timbering of the bow and stern are shown, but many of the interior structural elements are sacrificed to make the skeleton more visible. Nevertheless, the model gives a good impression of the complexity of a wooden warship – certainly fit for a king with an enquiring mind.

SLR0405 It would be a mistake to think that there were no significant developments in the way wooden warships were built during the eighteenth century, but because there is more information available for the latter half – and a few surviving ships, like *Victory* and *Constitution* – there is a tendency to describe later practice as if it were the norm. Older models are not reliable evidence because the typical 'Navy Board' style, with its unplanked lower hull, tends to employ a stylised version of the framing for decorative effect. However, this unusual model, dated to around 1717, demonstrates the exact framing of a small two-decker, as then built on its port side but with proposed changes on the starboard side; these alterations are most clearly seen in the timbering of the bow and stern, which demonstrate the introduction of cant frames.

That these were conscious policies is evident from a comparison with French practice, which was dramatically but consistently different. French frigates were longer, shallower and often more fine-lined, so at full load might displace about 25 per cent less than a British ship of similar burthen (a 'tonnage' calculated from the length, breadth and depth, known as Builder's

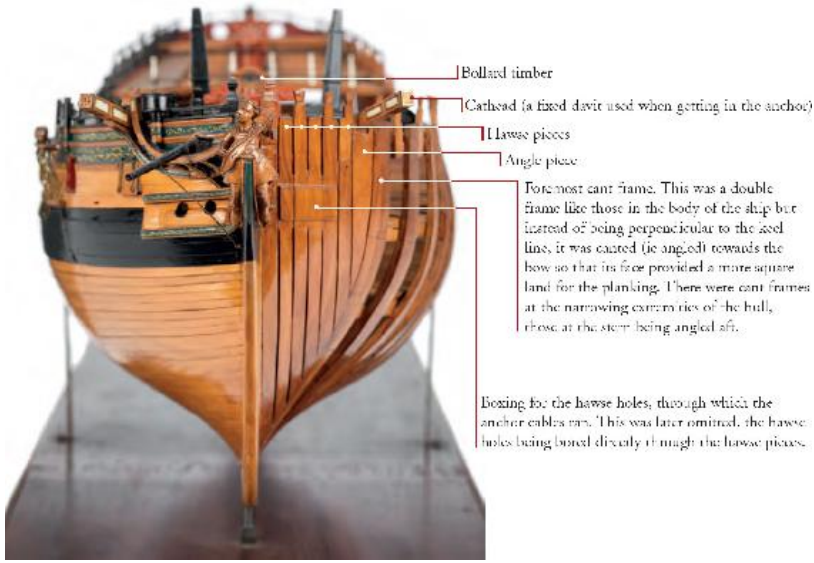
Measurement or bm for short). They were also more lightly built (typically, hull weight was about 48 per cent of full load displacement, or about 5 per cent less than for a comparable British frigate), largely because the frame timbers were of slighter scantling with more space between them. Associated with light timbering was a more limited scheme of fastening, particularly the absence of many of the knees, riders and other structural reinforcements common in British practice; this contributed to a lighter hull but one that was less rigid.

The many French prizes in Royal Navy service made these differences very obvious to the shipwrights charged with their upkeep, whose surveys and reports were usually critical – French frigates spent more time in dockyard hands, so cost more to maintain, and enjoyed shorter operational lives. In truth, they were never intended for the kind of hard usage to which the British subjected them – there was, for example, no French strategic requirement for all-weather, year-round blockade duty – so they were a rather different kind of ship. Put crudely, French frigates were predators, designed to go to sea on limited, well-defined missions, able to run down intended targets and escape on their chosen point of sailing from more powerful opponents. Their light construction served this role as consciously as their hull form.

When scrutinised carefully, the ways various navies built their ships reveals as much about their tactical and strategic priorities as the way they were designed.

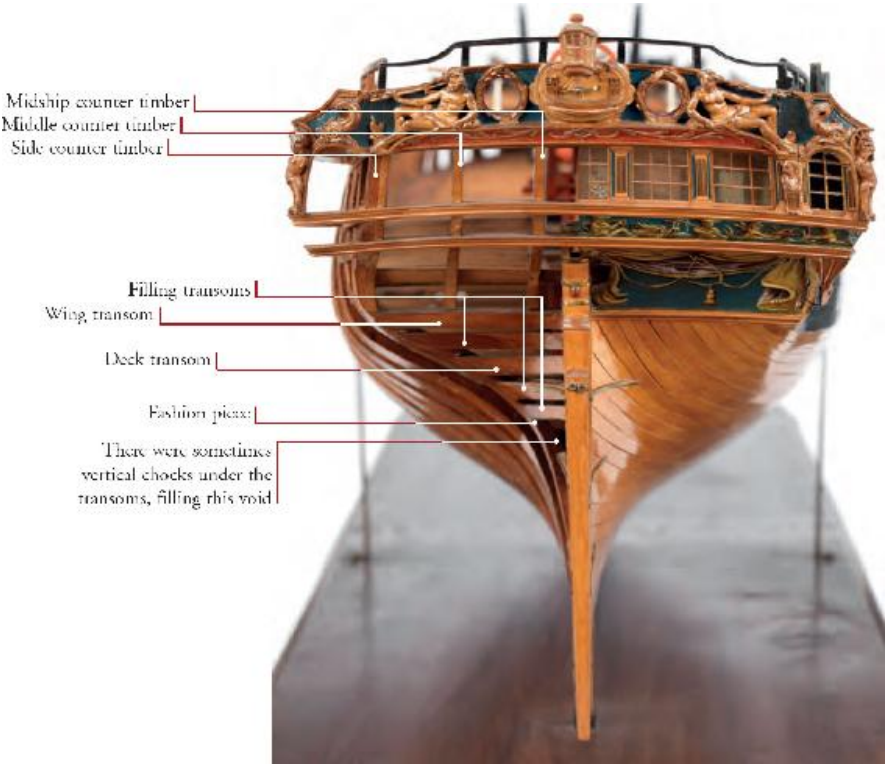
Bow Timbering

SLR0339


Bollard timber
Cathead (a fixed davit used when getting in the anchor)
Hawse pieces
Angle piece
Fore most cant frame. This was a double frame like those in the body of the ship but instead of being perpendicular to the keel line, it was canted (ie angled) towards the bow so that its face provided a more square land for the planking. There were cant frames at the narrowing extremities of the hull, those at the stern being angled aft.
Boxing for the hawse holes, through which the anchor cables ran. This was later omitted, the hawse holes being bored directly through the hawse pieces.

Stern Timbering

SLR0339



5: The Heavy Frigate 1778-1815

In an exchange of correspondence between the Admiralty and the Navy Board in October 1778, the Navy's administrators quietly ditched a century-old, though largely unspoken, precedent. It had always been believed that any significant increase in the size, and hence cost, of warships was not in the national interest; this had manifested itself not only in the building of the smallest viable ships of each rate, but also an unwillingness to promote any new type, like the 74 or the 12pdr frigate, which promised to be more expensive to build, operate and man. This reluctance was only ever overcome when the irrefutable evidence of war proved that British ships were so inferior in firepower or performance that fundamental improvements were essential.

On 21 October the Admiralty told the Navy Board that it was to propose no more small frigates under 32 guns but, on the contrary, it should consider more powerful ships of 36 or 38 guns with a main battery of twenty-eight 12pdrs. France was now in the war and her navy already had such ships, so the Admiralty, led by the experienced and highly competent Lord Sandwich, was responding in traditional fashion to a known threat. It was no part of the Navy Board's remit to make policy, but on the 29th they replied with a radical proposal to build the 36- and 38-gun ships with scantlings strong enough to carry 18pdrs: 'Such ships we conceive will exceed in strength any now possessed by the French and may be constructed with every advantage that such ships ought to have.' Their letter was accompanied by draughts for an 869-ton 36 by Sir John Williams and an even larger 938-ton 38 by Sir Edward Hunt.

After some deliberation the Admiralty ordered one 36 to be called *Flora* and one 38 which became *Minerva*: for the first time in the eighteenth century, the Royal Navy took the initiative in introducing a far larger and more expensive ship-type. The step-change was substantial. At a time when there was hardly a British-built frigate exceeding 700 tons, these new ships represented a huge escalation – the 36s typically cost nearly 40 per cent more

than a 12pdr 32, but the 38s were almost twice as expensive; on the other hand, the 36-gun ship offered 52 per cent more fire-power in broadside weight of metal and 62 per cent for the 38. They would not be built in large numbers, but for the first few years of their existence they had no equals in any other navy. They were highly regarded ships, and their entrance into service caused quite a stir – especially the 38s, which may be why there are a number of excellent contemporary models of them (apart from the two shown here, there is superb representation of *Minerva,* shown fully coppered, at Annapolis; and a model of *Arethusa* at Bristol, unplanked on one side revealing all the interior structure).

SLR0543 This model depicts the first 38-gun design, the *Minerva* class, by Sir Edward Hunt. As the name-ship was the only one of the class to have the hawse holes inside, rather than above, the trailboards, the model is probably intended to represent this ship. However, it is thought to have been made long after the ship commissioned and shows some anomalous features: as designed the quarterdeck rails stopped short at the after hance (above the ninth gunport) but was later carried forward to the main drift as in this model; as completed, the ship had solid ('berthed-up') barricades along the quarterdeck and ports rearranged for carronades. The model also shows the raised waist rails and flush gangways, modifications introduced during the building of *Minerva.*

As had become the norm since Anson's day, each Surveyor produced a comparable design, Williams' 38-gun draught being adopted for the one-off *Latona,* and Hunt designing a 36 which became the four-ship *Perseverance* class, built alongside the four of Williams' *Flora* class. It was not to be expected that such innovative designs would be perfect at the first attempt – indeed, the *Minerva* seems to have been draughted in a hurry and Hunt modified the lines of the three that followed. The main problems surrounded the size and weight of the 18pdr. The 141ft gundeck of the 38s was hardly long enough for fourteen ports a side – carrying guns so far forward and aft made them prone to heavy pitching – while the 9ft 41cwt guns were unwieldy. The latter problem was solved by designing a new 8ft 38cwt gun for frigates, and the last *Minerva* class ship, *Melampus,* was converted to a 36 during construction with only thirteen upper deck ports that were rearranged to keep them away from the extremities of the ship. She turned out to be the best sailer of the first generation 18pdr ships (there is a fine rigged model of the ship alongside the aforementioned *Arethusa* in the Bristol City Museum).

The two 36-gun designs were very similar in performance, and with 6

inches more between the gunports than the 38s, they were less cramped. However, the battery also stretched almost to the ends of the ship, and they were given rather full lines and a deep hull to compensate. This made them weatherly, good sea-boats and – being short – manoeuvrable, but they were not very fast by frigate standards. Nevertheless, the *Perseverance* class was well enough thought of that the design was revived in 1801 (see p75 for a model).

SLR0317 A far more detailed model, again thought to represent *Minerva,* which is certainly what was intended, but it presents a few oddities. The quarterdeck rails correspond with the earliest draught and the figurehead, allowing for the loss of limbs, is close to that shown on a later draught. The waist rails have been raised, as occurred while *Minerva* was on the stocks (although the gangways are not quite flush as in the other model, which was a slightly later modification), but the most noticeable departure from the known features of the full-size ship are the oar ports. These can be seen on the later ships of the class, but not the parallel Williams design for *Latona,* nor on any draught for *Minerva.*

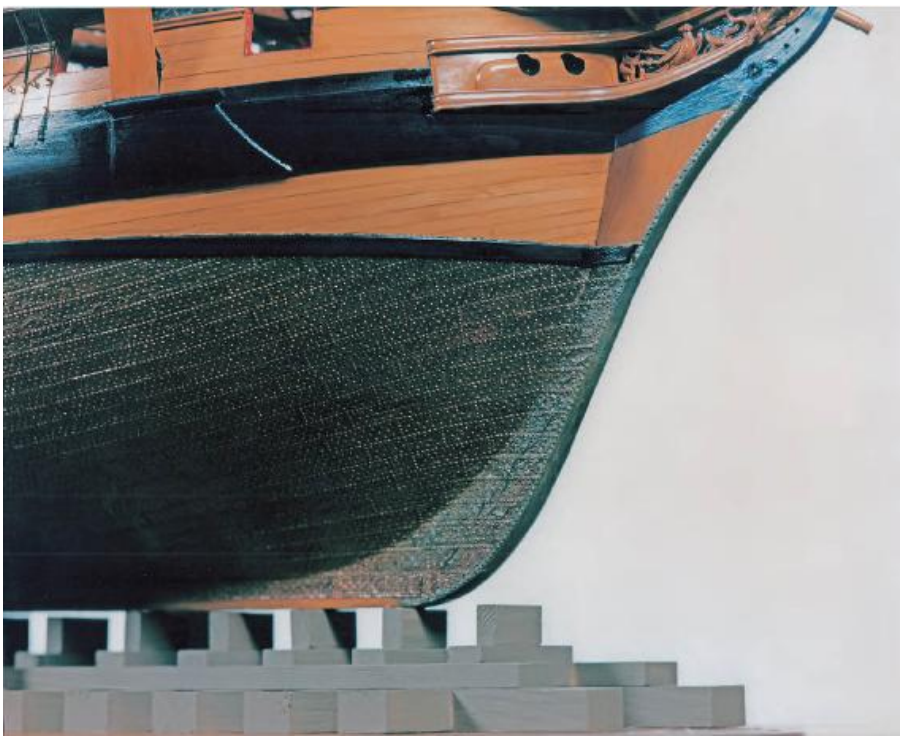
Five oar ports are shown on a sheer plan for her sisters *Arethusa* and *Phaeton,* positioned as on this model, except that the fourth oar port is squeezed in between the entrance steps and the fenders rather than under the end of the main channels. Many models – even those of apparently 'official' provenance – frequently reveal similar anomalies; given the accuracy of dimensions, modelmakers must have had access to copies of draughts (it is no accident that the most common 1/48th scale for official models was also the standard for the master draughts), but ships were modified during construction and later so unless a draught is clearly 'as fitted' they are not an absolutely infallible guide. In this case, the Navy Board issued a standing order to all dockyards in April 1781, ten months after *Minerva* first went to sea, that all frigates building or repairing were to have oar port cut, so she was probably so altered at some later date. It probably indicates that the model was made some time after the ship was completed.

COPPERING AND CARRONADES

Much has been made of the superiority of the French 'scientific' attitude

to shipbuilding; far less of the advantages of British technology to the Royal Navy. The French claimed to be the first to be able to predict a ship's stability mathematically, for example, but a class of 74s designed as late as 1778 proved their calculations hopelessly wrong; at precisely the same time the British were perfecting two innovations which were to prove of almost incalculable importance to the coming war effort. One was copper sheathing and the other was the carronade.

Ever since ships had gone to sea, the growth of weed and encrustation on the underwater hull – fouling – had been a problem, as it significantly retarded the progress of the ship through the water (for vessels of this era it could mean the difference of 2 or 3 knots). In warmer waters wooden hulls were also threatened by the *Teredo navalis* mollusc which bored along the lengths of timbers, potentially weakening them to catastrophic effect. The conventional remedy to both hazards was to cover the ship's bottom with either some primitive forerunner of antifouling paint, usually highly toxic, plus a sheathing of thin 'sacrificial' planking intended to keep the *Teredo* from the main hull.



HHR55 A close-up of the bow of the *Minerva* model at the US Naval Academy in Annapolis. The coppering on this superb model is entirely to scale.

SLR0585 Details of the coppering on a model of a frigate of about 1825. The general disposition and run of the copper gives a correct impression; the plates were a standard 48in by 14in size. Under the copper, various materials were tried to prevent corrosion of the iron hull fastenings, but none was entirely satisfactory, and after the American Revolutionary War was over a huge programme was put in hand to replace iron bolts with copper alloy substitutes throughout the fleet.

These were such fundamental problems that many unsuccessful alternatives had been tried over the centuries, but in 1761 the British sheathed the frigate *Alarm* in thin copper sheets. Galvanic action soon corroded the ironwork used to fasten the underwater hull, but although nobody understood the science, the British persisted with practical trial-and-error experiments until by 1778 they had a workable solution. A systematic scheme of coppering line of battle ships was put in hand in February 1779 and in the following May all frigates were ordered to follow suit. By 1781 half the battlefleet was coppered, along with 115 frigates and 182 smaller ships.

Coppered ships proved to have a huge tactical advantage – they were not only faster, but also 'fouled' more slowly, so retaining their speed advantage longer. Henceforth, any small superiority in sailing bestowed by a finer (but unsheathed) hull form would be more than cancelled out by the reduced frictional resistance of a copper bottom. Moreover, the coppered navy gained a massive strategic benefit in extended periods between dockings, in effect multiplying the number of ships it could have in service at any one time. Fighting not only the colonial rebels, but France, Spain (from 1779) and the Netherlands (from 1780), it is difficult to see how a vastly outnumbered Royal Navy could have coped without this trump card.

Having given the fleet a speed advantage, the Navy Board was simultaneously working towards enhanced firepower. Key to this was a new lightweight, short-barrelled weapon, capable of rapid fire but handled by a

small crew. Developed by the Carron Foundry in Scotland and christened the carronade, it was intended originally to allow short-handed merchant ships to defend themselves against privateers, whose favoured tactic was to board in order to do as little damage as possible to their prize. In these circumstances the gun's major drawback – its short range – was less relevant.

The carronade's origins are obscure but its very short length may have been inspired by the howitzer and existing swivel guns may have played a part – early versions were mounted in a similar fashion, on crutches, and some had a 'tiller' for aiming. At first they had trunnions like conventional cannon [SLR2966], but their development was rapid, particularly in the mounting as this was the most important contributor to its speed and ease of handling. Eventually, a pivoted slide mount became the preferred fitting.

In 1778 the carronade received the enthusiastic backing of the Navy's administrators, who saw its potential for anti-personnel fire and dismantling rigging. It was to be a supplementary weapon not a substitute, filling empty spaces on the upperworks, and frigates with their long and lightly armed quarterdecks and forecastles became the prime beneficiaries. There were teething troubles, particularly with muzzle-flash, which endangered the crew and – because the barrel did not protrude very far through the port – the lower rigging. The answer was to lengthen the barrel and later to add a muzzle extension, but the bulwarks were also planked up solid to protect the crew.

SLR2966 A model of an early form of carronade, with very short barrel and trunnions on which it pivoted for elevation.

Service reaction was mixed at first, but by the end of the war a number of high-profile successes for the carronade had swung Navy opinion in its favour. They were all removed for peacetime commissions after 1783, so they

were still seen as supernumerary weapons, but by the time war was again underway in 1794, the proposed additions for frigates were of far heavier calibre – 32pdrs for 38s and 36s, with 24pdrs for smaller frigates. At first carronades were entirely additional and, like the swivels they in effect replaced, they were not counted in the rating, but soon the huge advantage of a 32pdr or 24pdr weapon over the usual long 9s or 6s led to the replacement of conventional guns with carronades. By about 1800 most frigates had only two long guns as chasers on their upperworks and all remaining ports filled with carronades – but the traditional rating remained, so a British '38' regularly mounted 46 guns.

SLR2918 The mature form of the carronade and its mounting. The gun has a muzzle cup (extension), the trunnions have been replaced by loops underneath, and elevation is via a screw mechanism at the breech. The body of the carriage recoils and is run out guided by a groove in the slide, which is pivoted at its outboard end; trucks at its inboard end make it easy to traverse the mounting. If the pivot pin was located inside the gunport – called the 'inside principle' – the port could be smaller, but those over the channels might pose a danger to the shrouds from blast; the alternative 'outside principle', with the pivot stepped on the outboard edge of the sill, required a larger port, making the crew more vulnerable when reloading.

Carronades, with their range limitations, were perfect for frigates because they complemented a powerful battery of long-range guns on the deck below, and in many of the single-ship actions of the 1790s between nominally equal opponents, carronades gave the Royal Navy a massive firepower advantage. The French response was both slow and inadequate: the brass 36pdr *obusier* (howitzer) introduced about 1787 was a poor weapon, and it was not until 1808 that they had a satisfactory iron carronade, and even then of only 24pdr calibre.

The success of the carronade during the Napoleonic Wars led to their widespread usage throughout the British fleet, and smaller vessels often had their complete armament, except a couple of chase guns, replaced by carronades. They were expected to use speed and manoeuvrability to bring their guns to bear, but if disabled aloft they proved very vulnerable to any opponent with longer-ranged armament. A number of such actions during the War of 1812 prompted some reconsideration of their utility, and after 1815 they were gradually superseded by more powerful weapons – generally

shortened forms of 32pdr long guns in varying lengths and hence weights. By the late 1820s carronades were no longer included in the established armament of new frigates and the carronade principle was eventually abandoned completely in the 1830s.

SLR0705 During the Napoleonic Wars many of the smaller rates had their main batteries entirely replaced with carronades, retaining only a pair of long guns as chasers. The largest ships regularly rearmed in this way were small Sixth Rates, and this continued after the war. As built, the 28-gun *Samarang* of 1822 was armed like this, but the model depicts the ship after conversion to a sloop around 1842 and apart from the two 9pdr chase guns, the rest of her battery comprises short 32pdrs of a new type, halfway between carronades and conventional long guns.

SLR0643 Among the first frigates to benefit from carronades were the new 18pdr ships – this is a model of a *Perseverance* class 36 (there is a model in the US Naval Academy Museum, clearly labelled *Perseverance* on the stern, with exactly the same disposition of ports in identical barricades). In general the modelmakers of this period were slow to represent innovation, so this model is useful in demonstrating the permanent bulwarks that quickly followed the introduction of the carronade. Because of early problems with muzzle-flash endangering the shrouds, wherever possible carronades were positioned between the channels – on this model the smaller gunports over the channels are for long guns with the larger carronade ports numbers 3 and 6 on the quarterdeck (the 1779 establishment for this class was four 18pdr carronades, with another four on the forecastle, so matching the model).

The heyday of the carronade was short – perhaps four decades out of the four centuries that conventional smooth-bore cannon ruled naval warfare – but it spanned the era of the Royal Navy's greatest successes: this was not entirely coincidence.

War with Revolutionary France, 1793

In the decade after the end of the American War, 18pdr 38- and 36-gun ships remained a small minority of the frigate force. There seems to have been no formal decision to abandon frigates armed with 12pdrs, but the first post-war order, placed in 1790, was for 32-gun ships to carry a main battery of twenty-six 18pdrs – despite the ships being only 10 per cent bigger than previous 32s. Ever since the decision to build no more 28s, the 32s had been the smallest frigate rating, so this was a de facto admission that the 18pdr was now standard for all frigates.

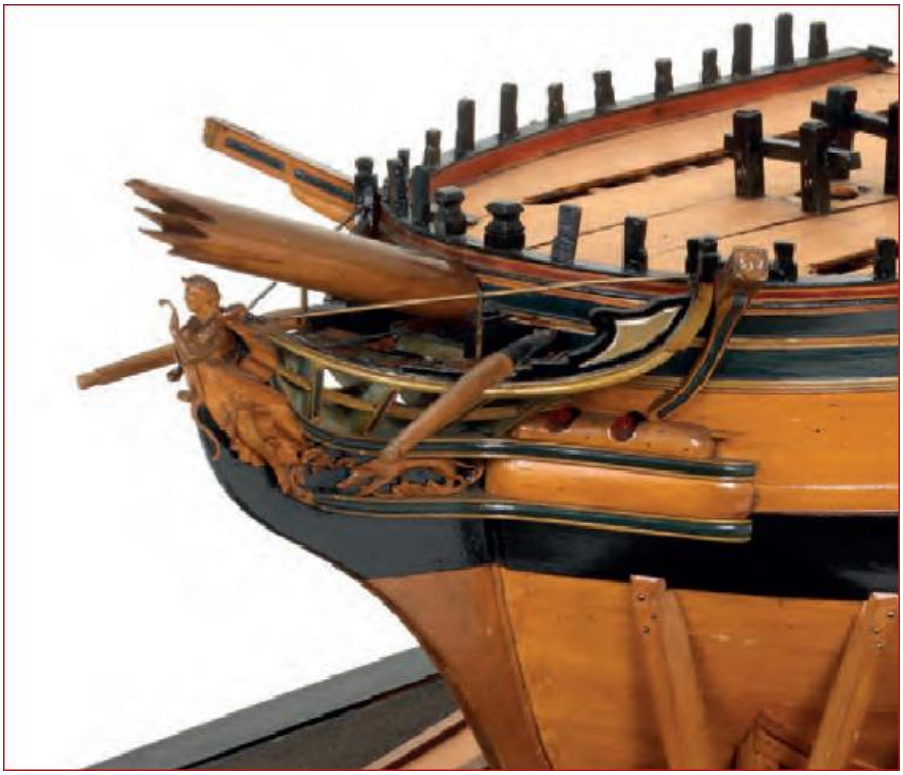
By the time war with France erupted once again in 1793, there were two new Surveyors, Sir John Henslow and Sir William Rule, his junior in seniority. Neither was very radical in their thinking, and their frigate designs were incremental improvements on existing 18pdr classes. The main

difference was increased length. This was partly a response to a widespread concern that British ships were not fast enough, and as speed is a function of waterline length, many of the designs of this period were becoming longer, both absolutely and relative to breadth. The first new 36-gun class was essentially Hunt's *Perseverance* with a 5ft section inserted amidships, but Henslow's 38 was a more subtle extrapolation from the slightly modified later ships of the *Minerva* class, again about 5ft longer. These became the nine-ship *Artois* class, the benchmark for 38s in the early war years. The other reason for additional length was that the upper deck batteries of first-generation ships were too cramped and carried too far forward and aft over the fine-lined ends of the ships, producing unwelcome pitching in a seaway. Extra length allowed either more space between gunports, or a more centrally positioned battery, or in some cases both.

From 1794 carronades were added to the armament of frigates: 24pdrs for 32-gun ships, but 32pdrs for 36s and 38s. The latter were already established with eight 9pdrs on the quarterdeck and were now expected to find additional room for six carronades; the two 9pdr forecastle chase guns were also joined by two carronades.

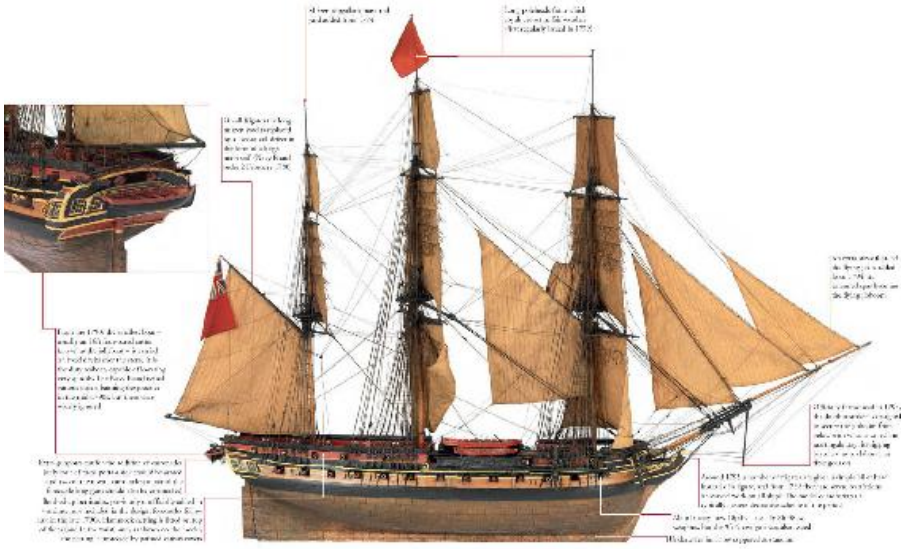
SLR0342 There are three contemporary models of the *Artois* class 38s in the National Maritime Museum. This one was supposedly made for the ship's designer, Sir John Henslow, and it was certainly in the hands of his descendants until presented to the Museum. It follows the design draught for the class quite closely, including the raised gunwale amidships to make the gangways flush (a modification ordered during construction), but it does not have the oar ports drawn on the draught – interestingly, there are five of these a side, in precisely the positions shown on the *Minerva* model [SLR0317].

SLR0572 Another model of an *Artois* class frigate, this one shown on a slipway ready for launching. It is very similar in its features, and even its craftsmanship, to SLR0342, and in both cases the figurehead and iconography of the decorative work suggest the model is meant to represents the *Diana.* The conventions of this hull-only display style allowed the modeller to omit many small fittings (and even details like oar ports) in favour of a decorative effect, heightened by elaborate carved work and a colourful paint scheme. The open quarterdeck rails replicate those on the design draught – berthed-up barricades having been removed from frigates by an order of 1786 – but by the time these ships completed, solid bulwarks were again in fashion, and the addition of carronades meant that an extra, seventh, gunport had to be contrived on each side of the quarterdeck.



THE FRIGATE ABOUT 1795

This model is difficult to identify with confidence but has the general features of an *Alcmene* class18pdr 32, first ordered in 1794. Unusually, it is a fully fitted and rigged model of the ship ready for sea and although not all the details are entirely correct, it is a good representation of how the frigate had developed since 1760 as demonstrated in the *Lowestoffe* model on pp58-9.



Gangways in the waist are wider and raised to fit flush with forecastle and quarterdeck. The spare spars and expanded outfit of boats are now carried on transverse skid beams

The Spencer Admiralty, 1794-1801

The new Admiralty led by Lord Spencer that took office at the end of 1794 shook up many of the traditional administrative practices, not least in the field of ship design. The policy of ordering competing draughts from each of the two Surveyors was continued, but Their Lordships were now inclined to add a third, by reviving the old tactic of instructing that ships be built to the lines of specific French prizes. It is not obvious how, or why, the particular French prototypes were chosen, as they tended to be rather similar ships, and not necessarily the largest; nor were they radically different from the ships then being designed by the Surveyors, which had once been a major goal of this approach. Furthermore, virtually all of these designs were built as single ships, which suggests a succession of trials rather than a firm belief in the superiority of any one hull form. In fact, it may reflect no more than a widespread but unscientific prejudice among the naval establishment in favour of French design.

As each new class was slightly bigger than the last, with the Surveyors now allowed to match the specifications of the French 'copies', there was at least a rapid increase in what was regarded as the norm for British frigates – a gundeck length of about 150ft and a tonnage around 1050bm. This escalation was repeated in every category of the fleet, the Spencer Admiralty overturning the traditional restraint on growth and allowing the size of the latest British ships to match – and in a few cases exceed – those of their enemies.

The recourse to French prototypes was a revival of the tactic used by the Anson administration in mid-century to force through radical changes, but Spencer's Board was prepared to cast its net even wider in the search for technical innovation. Not since the days of Lord Danby had the ideas of well-connected amateurs been given substantive official support, but some of the projects the Admiralty financed in the mid-1790s were every bit as eccentric and experimental. Probably the best-known are the double-ended sloops *Dart* and *Arrow* designed by Samuel Bentham, but the largest vessel to come from an unconventional source was the 855-ton 32-gun frigate *Triton*, ordered in 1796. On the draught, where the Surveyor's signature normally claimed responsibility, it simply says 'Admiralty', but the actual design was not the work of a committee – it was produced by one of the commissioners, Captain James Gambier, to test some of his pet theories on naval architecture. These included great length, wall sides and virtually no sheer, as well as an unusual bow shape.

SLR0589 Gambier was obviously very proud of his brainchild and apart from this model of *Triton* he also commissioned a portrait of the ship from Nicholas Pocock, the leading marine artist of the day. The model gives a clearer idea than the painting of the salient features of the design, which was intended to use as much straight (and therefore economical) timber as possible: the ship had no sheer and was almost wall-sided. However, the hull form was also unusual, being very long and relatively shallow like French frigates, but with a steeply raked overhanging bow that flared out to meet a wide forecastle. Although the ship was fast, she was leewardly and the bow was not judged a success – it caused a slamming action when pitching, which strained the hull. The ship's active career was short, being reduced to harbour service in 1802. The model probably predates the completion of the ship because the foremast is in its original position, whereas the draught shows it moved forward a couple of feet.

The ship was built of fir – another Anson-era expedient which had been revived the previous year for six frigates urgently needed for service against the Dutch – and this allowed *Triton* to be completed in little more than six months, at the expense of reducing the main armament from 18pdrs to 12s so as not to over-stress the lighter structure. In service the ship proved disappointing, but this did not deter the Admiralty (presumably in the person of Gambier) from further interference in the design process. Rule's draught for what became the 32-gun *Amphion* class was much modified at their behest (as was the 74-gun *Plantagenetn*) and in 1799 another frigate, the 36-gun *Ethalion,* was attributed to the 'Admiralty'. These ships all manifested aspects of Gambier's design concepts – particularly the flat sheer and high length-to-breadth ratio – but the extreme form of the bow was toned down. In this they conformed to the general trend towards hulls of more French proportions apparent in the designs of the 1790s.

The legacy of the Spencer administration was to be a rapid succession of frigate designs, generally escalating in size, but usually ordered before there was time to evaluate the previous class. Few designs were built in any numbers, but when large programmes of standard ships were ordered later in the war, all the prototypes would be vessels built by this administration.

SLR0663 A French model of a 40-gun frigate, typical of so many captured during the wars of 1793-1815. A number of French prizes were used as prototypes for British frigates in the 1790s, but they were not simply clones. Long, relatively shallow and lightly built, French frigate hull forms had a number of disadvantages for British purposes: they tended to be leewardly, so even if fast in some circumstances they could be overtaken by more weatherly ships; the structure was more easily wracked by stresses, so they wore out more quickly or required more time in maintenance; and they could not stow enough water and provisions for very long range cruising. The British-built 'copies' could be more robustly constructed but they followed the hull lines and general proportions of their French models, so usually suffered the same disadvantages of shallow hull forms. As the war progressed and British naval officers gained more experience with French prizes (or French-derived hull forms), these shortcomings became more evident and there was less clamour about the 'superiority' of French design.

The model itself seems to be French prisoner-of-war work, with typical features like guns that can be run out by pulling on cords, and craftsmanship that is very different in style from British-made

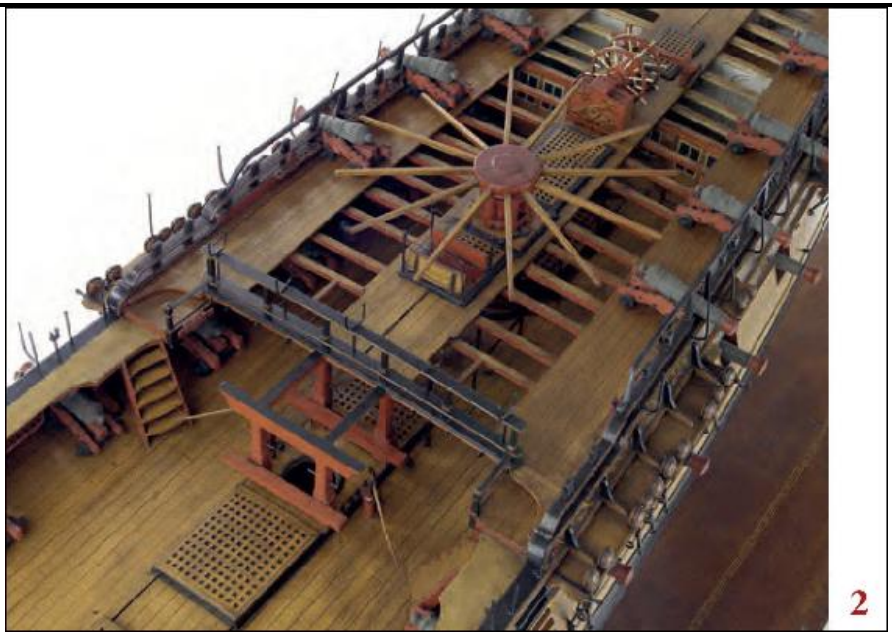
models of the time. However, despite the tricolor (which is thought to be original), all the salient features of the ship represented are British rather than French – the shape and decorative scheme of both bow and stern, the separate bridle port which is almost unknown in French frigates, the drumhead capstan, and many aspects of the masting and rigging depict British practice. French prizes were sometimes completely rebuilt in Royal Navy service if the ship enjoyed a high reputation, so perhaps the most appropriate way to view this model is as a depiction of such a ship.

SLR0707 A major disadvantage for the French navy in single-ship actions of the 1790s was the lack of an equivalent to the British carronade, which gave Royal Navy cruisers a far larger broadside weight of metal than enemy ships of equivalent size. After persevering with a very inadequate 36pdr brass *obusier* (howitzer), France eventually developed an iron 24pdr weapon in 1804, but even then its distribution through the fleet was slow. The *obusier* was mounted on a long carronade-type slide which took up a lot of room and limited where it could be fitted, but the 24pdr went to the opposite extreme with a very short bed that allowed very little recoil. The Royal Navy carried out extensive tests with non-recoil mountings in the 1790s and concluded that they could not stand rapid fire and were dangerously prone to 'oversetting' in action. This model of a French frigate shows two of these weapons on the forecastle.

FILLING IN THE WAIST

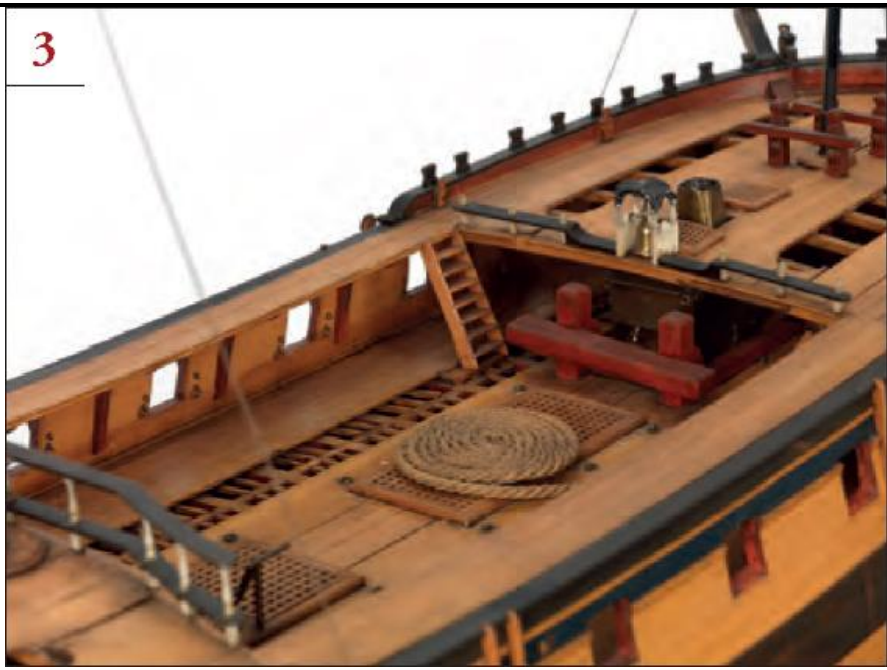
The forecastle and quarterdecks were originally entirely separate, but a significant trend in the development of the frigate was the gradual closing in of the waist, eventually producing an uninterrupted spar deck. The main stages of this process are demonstrated by these models.

SLR0475 The 1745 Establishment that introduced a longer quarterdeck and a more substantial forecastle also added a broad capping strip over the waist gunwales. This may have been wide enough for an agile seaman to use as a shortcut from one deck to the other but it was far from any sort of gangway.

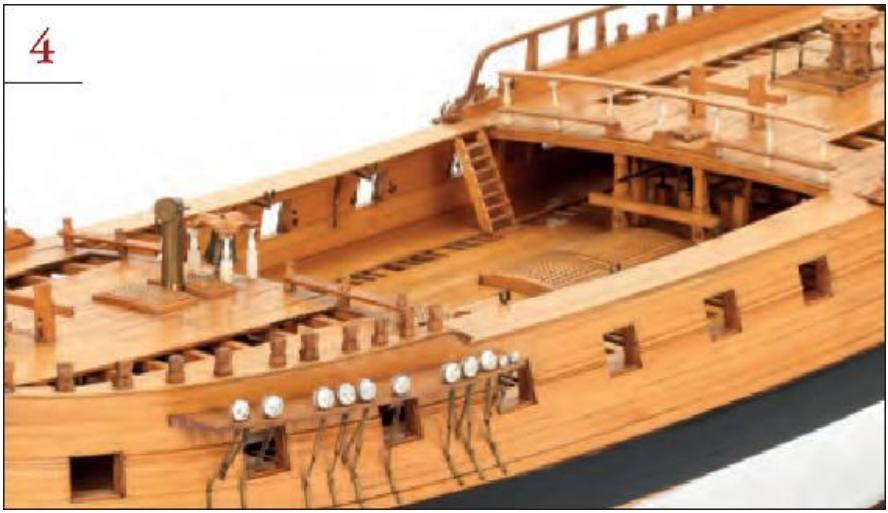


SLR0315 With the 'true' frigate came a broadening of this capping strip into a gangway. Although this was still very narrow, it allowed men and swivel gun mountings to be to be

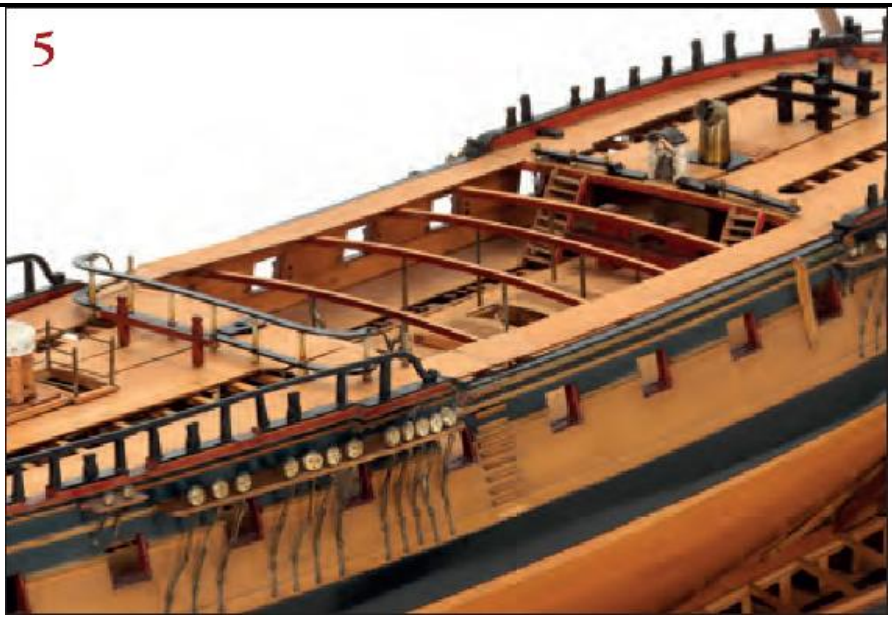
disposed along the waist, which was important in close action when boarding was a potential threat. From about 1757 quarterdecks were built with short extensions forward at each side, called on draughts 'the fixed part of the gangways', usually forming landings for the steps down into the waist. They were 'fixed' in the sense that they were structural whereas the gangway boards were just a light platform. At this stage there was still a step down on to the gangway.



SLR0318 In 1782 there was a general order to raise the waist of frigates and to make the gangways flush with the decks fore and aft. They remained fairly narrow and were not integrated – the run of planking was not carried from forecastle and quarterdeck into the gangways.

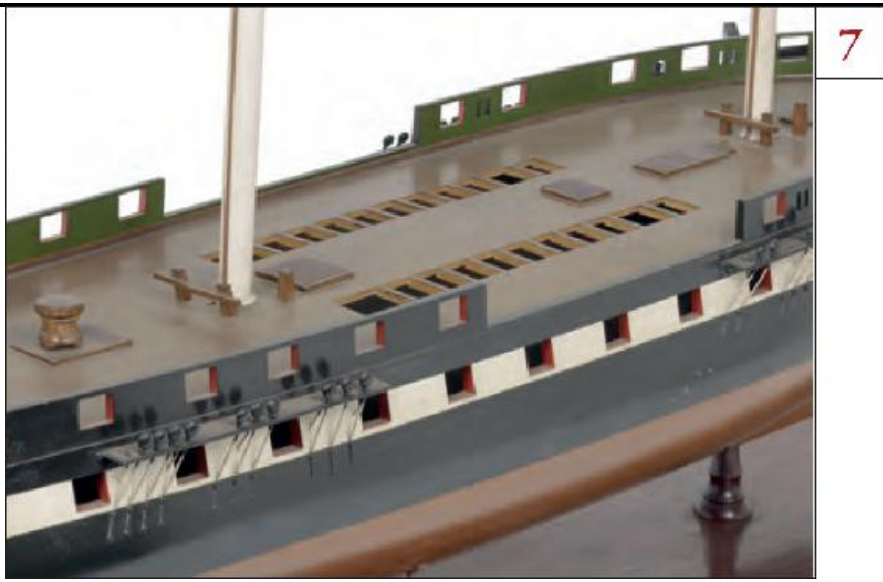


SLR0543 This coincided with the fitting of moveable skid beams across the waist (the crutches for these are represented in brass on this model) to carry the spare spars and an increasing outfit of boats. The gangways now needed greater support and the models suggest this was provided by iron knees, the ends of which formed the skid-beam crutches.



SLR0572 This was a short-lived expedient and by the 1790s frigates had fixed skid beams fitted *under* the gangways.

SLR0674 An order of February 1805 integrated the gangways fore and aft so the upperworks, in effect, now formed one continuous deck. Structurally this was achieved by making the skids standard deck beams and supporting the gangways with the same beam-and-carling system that underpinned the forecastle and quarterdeck. This was recognised in 1809 when the breastworks that had marked the limits of quarterdeck and forecastle were abolished. From 1810 some frigates began to fill the remaining open space in the waist with light gratings, to produce a makeshift spar deck.



SLR0738 After 1815 there was a short-lived flirtation with ‘double-banked’ frigates, mounting a complete battery on what was called the spar deck, but the waist guns interfered with sail handling so badly that the ship could not be fought and manoeuvred at the same time – a crucial consideration in a single-ship action. Thereafter, even though there was effectively a continuous upper deck, there might be a break in the bulwarks amidships and openings over the waist – regarded as useful in battle to help disperse gun smoke from the gundeck.

Quantity before Quality, 1801-1815

The 'big ship' era associated with Lord Spencer's Admiralty came to an abrupt end in February 1801, when a new administration took office, dedicated to retrenchment and reform. The incoming First Lord was Admiral Earl St Vincent, a man who believed naval wars were won by superior discipline and training, not technology. His views on naval architecture were ultra-conservative and he certainly disapproved of the inflation in ship-size, telling Spencer himself in a very pointed fashion as early as 1797 that 'frigates are grown preposterous; I never wish to see one larger than the *Inconstant.*' This, the original 18pdr 36-gun design of 1778, was only about 870 tons, whereas the current norm was nearer 1000. Needless to say, once in power St Vincent applied his prejudices with vigour, ordering a repeat *Inconstant* class of five ships. It should be remembered that the sailing qualities of this design were so poorly regarded that the hull had been lengthened by 5ft in 1794 for the *Phoebe* class.

This was one step backwards, but St Vincent's Board then reversed even further into the past, reviving the *Richmond* class – one of the first 12pdr 32-gun designs of 1756 – and at 650 tons completely outclassed by anything calling itself a frigate built in the previous two decades. The inspiration for this was almost entirely party-political, as the administration had backed the Peace of Amiens to be more than the short-lived truce it turned out to be, so on the renewal of fighting in 1803 it came under intense parliamentary criticism for its lack of preparedness. By the time the government fell in 1804, it could counter that eight 'frigates' were newly ordered – as long as nobody asked how they defined the term: Charles Napier, who was to command one, described his ship as a mere 'shoebox'.

Frigate design continued to waver during the following two years. In one of the most curious initiatives of the era, the Admiralty of Lord Barham ordered three one-off frigates, each based on a relatively small French design of the previous generation; it was as if Barham were harking back to the ships he had been familiar with as Controller of the Navy Board in the 1770s. All three were much criticised in service, and none was repeated.

However, from 1806 as the conflict with Napoleon became an all-out economic war, the sheer number of ships required to impose a continent-wide blockade began to supersede individual quality as the Admiralty's focus. There were no new frigate designs; instead, large numbers were built to a few chosen models, and for frigates all were classes first ordered by Spencer's Admiralty in the 1790s. The 36-gun ships were of the 950-ton *Euryalus* class of 1798, and there were two 38-gun designs, the 1070-ton *Leda* of 1796 and the slightly larger *Lively* of 1799.

SLR0643 A characteristic feature of Admiralty shipbuilding policy under St Vincent (1801-4) was the return to older and smaller designs. For frigates this included the five ships of the *Tribune* class, a revival of the *Inconstant* (or *Perseverance*) class 36s, originally ordered in 1778. The later group were almost identical to their prototypes except that inserting a bridle port right forward involved a slight rearrangement of the upper deck gunports. This model, therefore, is probably intended to represent one of the earlier group, but as she would have looked about 1805, with berthed up barricades fore and aft and integrated gangways.

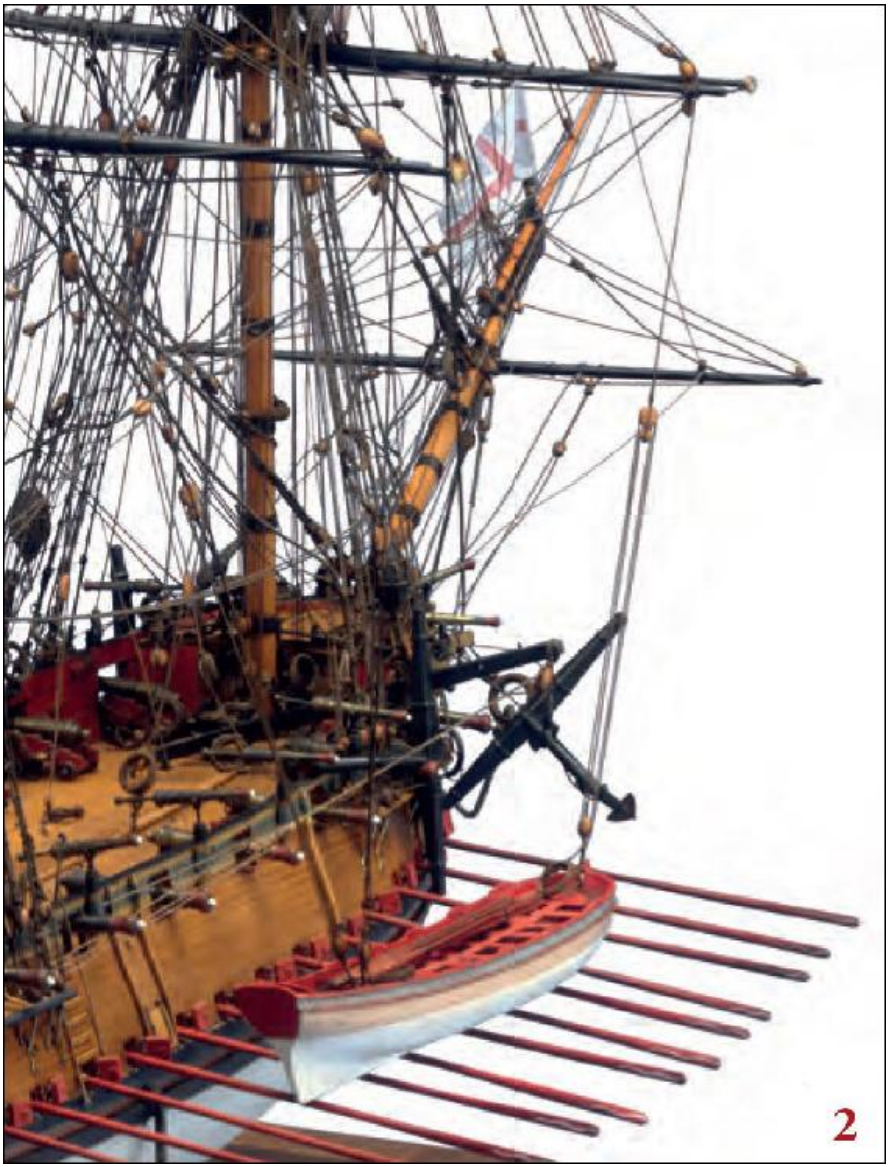
SLR0674 From 1806 frigate building was confined to three classes. Two were homegrown, designed by Sir William Rule, but the *Leda* class was based on the *Hébé,* one of the first French 18pdr frigates, which had been captured in 1782. The *Ledas* were constructed in the usual robust British fashion and the excessive tumblehome of the topsides reduced, but the proportions and lines remained French, so they were not quite ideal for the Royal Navy's purposes – they stowed less than the *Lively* class and were not such good sea-boats, but their fine lines made them popular commands. This large 1/32nd scale model depicts *Lacedaemonian,* one of four ordered in 1808, and shows the appearance of the class from about

1810 onwards, after the forecastle and quarterdeck breastworks were removed and gratings added over the waist. There should be two more gunports a side at the forward end of the quarterdeck barricades. Nine ships were completed in time to see action, but a further seven were under construction by the end of the war. The most famous ship of the class was the *Shannon,* victor over the American *Chesapeake* in 1813, and the kudos surrounding the ship may have contributed to the decision to make the design the standard post-war 18pdr frigate, a further twenty-five ships being ordered.

SLR0575 A 1/96th scale model of the *Révolutionnaire,* a French 40-gun frigate captured in 1794, but shown as refitted for Royal Navy service. The ship had an outstanding reputation for speed – she once sailed 129 miles in 9½ hours at an average speed of over 13kts – but she was not one of the prototypes chosen by Spencer's Admiralty, possibly because at 1147 tons she was bigger than required. Curiously, despite St Vincent's publicly expressed contempt for large frigates, his administration ordered one ship to the *Révolutionnaire*'s lines in 1801, but did nothing to get it built: it was ten years before the ship was laid down and, as the *Forte,* she was launched just in time to go into Ordinary at the war's end. At much the same time, in what was to be the Admiralty's last cultural genuflection to French design, a new frigate was ordered to the lines of the *Président* (a near-sister of *Révolutionnaire*) that became the *Seringapatam.* Intended to be a post-war standard frigate to be built in parallel with the *Leda* class, the new design proved very disappointing and eventually underwent two major revisions before a satisfactory version was achieved.

SHIP'S BOATS

SLR0476 From the late seventeenth century frigate-sized ships generally carried two boats. Although both could be rowed or sailed, one was generally a heavy workboat, optimised for seaworthiness and carrying capacity, while the other was a longer craft intended for higher speed under oar or sail. For Establishment-era Sixth Rates these were a 17ft yawl (a lighter alternative to the longboat regularly carried by larger ships) and a 27ft pinnace, respectively. While there are numerous models showing the latter – stowed over the spare topmasts on gallows in the waist – the former is usually absent, which is appropriate in display models as the biggest boat was normally towed at sea. The yawl was to have 'a trunk fixed in the midship and a windlass fitted as to weigh and carry out an anchor'.

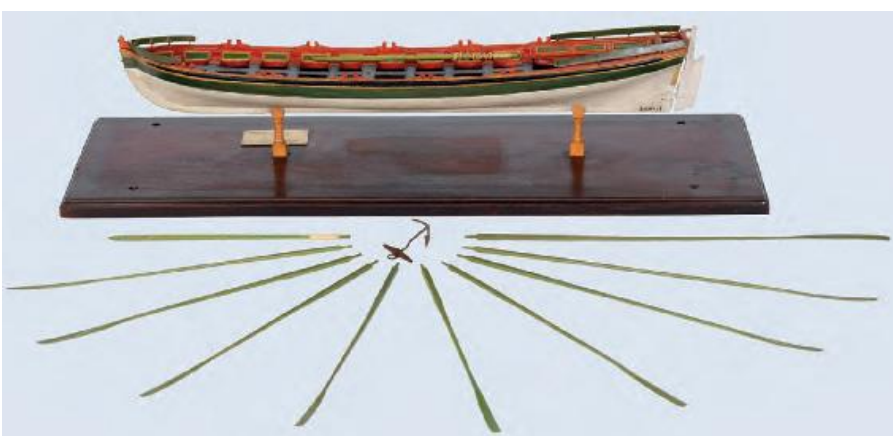


SLR0411 Because it was stowed in the waist, it was a cumbersome process to launch the boat. As demonstrated by this model, it required a complex web of stay and yardarm tackles to get the pinnace in and out of the water, which could not be achieved in a hurry nor with the ship underway. It was not impossible to stow the yawl inboard as well, but it encumbered the deck and probably interfered with the handling of the guns in action, so it is no wonder it was usually towed. From 1720 there were moves towards shorter and lighter longboats that were easier to stow.

SLR0330 A model of a longboat of about 1750 rigged for sailing. This 28ft boat is larger than that issued to frigates, but is otherwise very similar. The longboat was the ship's heavy lifter: it could be used for anchor work or moving cannon, as well as carrying the largest load of casks when watering or revictualling. There was usually a windlass amidships and a short davit (or crane) could be rigged over the transom to facilitate these duties.

4

SLR0339 The new frigate-form ships were allocated three boats: the 12pdr ships had a 23ft longboat, a 30ft pinnace and a 24ft yawl; the 28s carried the same three boats but in shorter lengths, 22ft, 28ft and 23ft respectively. As demonstrated by this model of *Lowestoffe* of 1761, the stowage arrangements remained the same, reinforcing the temptation to tow the heaviest boat – by now the longboat – whenever feasible. Towed boats were easily lost, while the additional drag was not popular with captains of fast frigates, so those on Channel service often left their longboats behind in port – during the Seven Years War strict orders had to be issued to prevent this practice.

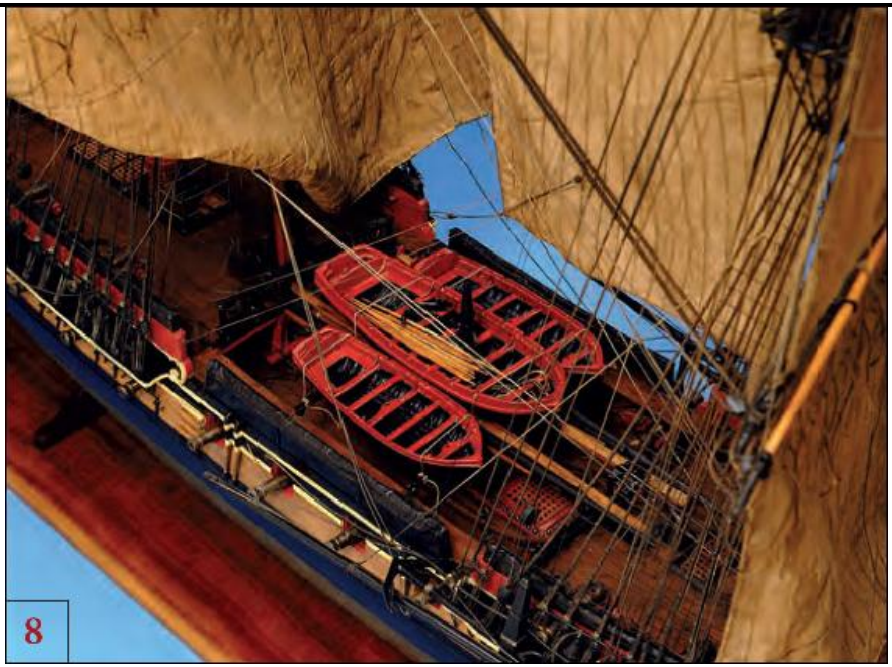


SLR0578 There was a degree of confusion in common usage about barges and pinnaces, both of which were long, narrow, relatively light boats principally intended for easy rowing and of carvel construction (*ie* where the planking met edge to edge, producing a smooth outer skin). Generally speaking, barges were larger than pinnaces, and associated with flag officers whereas pinnaces were more utilitarian. This 10-oared boat, usually called a barge, is from a 74-gun ship, so about 2ft longer than the pinnaces initially issued to frigates, but from the 1790s the larger frigates replaced their pinnaces with 10-oared barges.

SLR0711 The year 1780 saw the introduction of two new boat-types in all frigates. The first, a direct replacement for the longboat, was the launch. Derived from a dockyard workboat, this was flatter in its sheerline and squarer in section, trading the more sea-kindly form of the longboat for increased carrying capacity. This model was made about 1818 to demonstrate the ideas of John Cow, the Master boatbuilder at Woolwich. Launches and longboats had always slung heavy loads under the hull but Cow invented watertight trunks that allowed the lashings to be brought directly to the windlass amidships, increasing the potential burden. The model is marked with various load waterlines, the highest suggesting a 20-ton load, but this required too high a side and in trials Cow's launch was judged unstable. Conventional launches had less freeboard.

SLR0774 The other innovation of 1780 was the cutter, a lighter boat built clinker-fashion, in which the strakes overlap and are clenched along the edges, so requiring less by way of internal framing. This was not entirely novel for ships' boats: earlier in the century frigates'

yawls had been of clinker construction, but only when the ship was on a home station; clinker required specialist maintenance and ships ordered abroad carried carvel-built variants. However, the cutter was a new design and proved a highly successful all-round boat, with good qualities under both sail and oar. This model dates from about 1838, but the shape and structure of the cutter had not changed greatly since the earliest examples.



SLR0346 In the new 18pdr frigates of 1780 the outfit was increased to four boats: one of the new launches (26ft for 38s and 23ft or 24ft for 36s), the usual 30ft pinnace, and two 24ft cutters. In addition, from June 1781 an 18ft 4-oared cutter (soon christened the jollyboat) was added to the establishment of all frigates. It is easy to see how this larger set of boats drove the development of the waist in frigates; without transverse beams it would have been impossible to stow all these craft inboard. This model shows the launch flanked by two cutters, but its pinnace is absent – it would probably have been stowed to one side of the launch with a cutter nested inside the launch or other cutter. The jollyboat is out of shot, slung from the stern davits, an innovation of the 1790s.

SLR0651 This rather crudely finished model purports to represent the 38-gun *Pomone* of 1805. It may well be sailor's work, and is certainly notable for including a number of details missing from official models. Two aspects of the boat outfit command attention: one is the stern davit, an unofficial feature whose existence is only acknowledged by the number of official orders in the 1790s instructing captains *not* to add them; the other – less visible – is a 12pdr boat carronade in the outermost starboard boat; these were issued to all 50-gun ships and smaller from 1795-6. Also interesting in their absence are quarter davits which began to be employed in the first decade of the nineteenth century.

10

SLR0648 As the Napoleonic War progressed frigates found themselves increasingly operating against shore targets in cutting out expeditions and coastal raids. To increase their firepower in such situations Captain Edward Brenton devised a gunboat yawl which could operate in attack or cover a retreat – it was double-ended and the 12pdr carronade armament could fire from either. For stability, when sailing the carronade was lowered into the bottom boards (inset). They began to be issued in 1803 and a number of frigates carried them in lieu of the launch. This model is slightly different from Brenton's drawings but the boat was modified by the Navy early in its service career

11

SLR0773 After 1815 a number of new types were added to the roll-call of boats, the principal addition for frigates being a gig. These were very long, narrow and light pulling boats of clinker construction, related to (and sometimes confused with) the galley; they were usually appropriated to the captain's use. This example dates from 1838.

SLR0705 In the nineteenth century the frigate's outfit of boats rose to seven, which by about 1850 comprised: a launch, a barge, a pinnace, two yawls or cutters, a gig and a jollyboat. Sixth Rates carried the same number but made up of two pinnaces, two yawls or cutters, gig, jollyboat and a dinghy. As shown in this model of *Samarang* as she was about 1845, both stern and quarter davits are now iron. In the largest frigates the stowage amidships was no longer left to the discretion of the captain, but the arrangement became part of the design, shown on the draught, with the iron crutches on which the boats were mounted made to measure for specific boat types.

Structural improvements

The later stages of the struggle against the Napoleonic empire became a war of attrition, with the Royal Navy employed all around the European littoral and on every ocean of the world. It was an economic war to the death, with Napoleon's 'Continental System' attempting to embargo British goods, while the British blockade strangled the trade of the enemy and neutrals alike. It was a policy that not only required more and more ships but imposed ever more sea-time on those ships. The results were two-fold: demand for scarce timber resources drove up prices, while increased wear and tear placed even greater emphasis on structural strength. A particular source of worry was the natural crooked timber used for knees, which secured the beams to the frame – and British ships used twice as many because they were fitted in two dimensions, one vertical ('hanging') and one horizontal ('lodging') compared to the one used in French ships.

To adapt an infamous description of a Second World War bomber, a wooden ship was thousands of pieces of timber sailing in close formation; no one element was very large and the structural integrity of the whole depended largely on the strength of the fastenings. For the British, who had always prided themselves on the strength of their construction methods, the challenge was to retain that advantage in the face of increasing costs and deteriorating ships.

Acutely aware of the problem, Dockyard personnel from at least the 1790s

had worked on various ingenious schemes to improve the structure, usually involving iron or other substitutes for traditional knees. There was so much at stake that careers could be made (or broken) by the effectiveness of these schemes, so it was a highly competitive – but highly creative – environment. From this ferment there emerged one clear winner: the system devised by one of the Surveyors, Robert Seppings. Descriptions usually concentrate on the diagonal bracing, and look to the post-war lengthening of ships it made possible but, like the hulls he built, his was a nexus of interlocking ideas, none in themselves original, but adding up to a huge advance in wooden shipbuilding technology. Often overlooked is the fact that his system employed much small and reused timbers, so was cheap and economical, and was first demonstrated in the repair of a badly hogged 74 that was substantially 'straightened' by his methods.

This was not, as it is often presented, a purely engineering solution to the problem of building stronger (and longer) ships, but was a practical response to peculiar requirements of the last years of the war. The mature expression of his ideas did not see the light until after 1815, but by then all the real work was done.

SLR2305 A longitudinal section of a *Lively* class 38 modified to incorporate Seppings's methods. The model does not show the post-war round stern so must date from the last years of the Napoleonic Wars, about 1814. Seppings modified his bracing scheme for frigates, replacing the wooden trusses with lighter iron straps – as can still be seen in the *Unicorn* of 1824 preserved in Dundee – and it is often thought that this earlier version was never adopted, but all the framing draughts for frigates building in the first few post-war years show it, and wooden trusses were definitely used in the repair of a number of older frigates in that period.

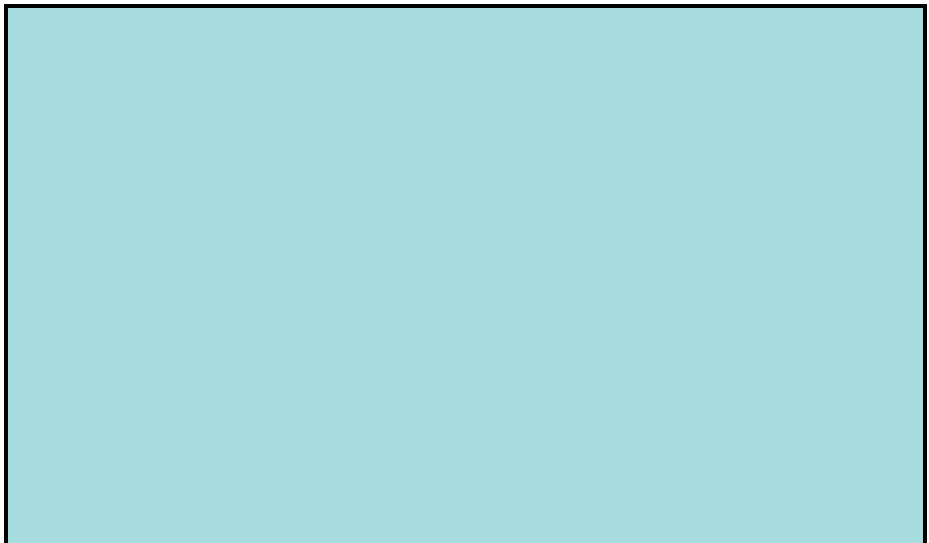
SLR2300 A sectional model of the waist area of a 74-gun ship demonstrating the principles of Seppings's system. Although the diagonal braces always receive headline attention, there were many other elements that contributed to the strength and integrity of his methods. Lodging knees (those in the fore-and-aft direction) were replaced by a substantial shelf under the beam-ends and an enlarged waterway timber above it, while hanging knees were replaced by cheaper chocks under the beam-ends secured with iron fork knees. The inner ceiling planking was omitted, making it easier to discover and remedy defects. All in all, Seppings argued that his system saved expensive oak – about 180 trees or one-seventh of those needed for a line of battle ship, because his methods used much inferior and shorter timber. It also had some adventitious but important advantages, like increasing the space in the hold, allowing a 74-gun ship to stow 40 tons more water and enhancing its cruising endurance accordingly.

SWEEPS AND SWEEP PORTS

In the earliest frigates of the seventeenth century the facility for rowing was an integral feature of the design. These were small, light ships so it is easy to appreciate that long sweeps manned by a large crew could give them real movement in certain circumstances – there are, for example, many reports of merchantmen captured by privateers rowing up to them in a calm. What is more difficult to understand is why sweep ports continued to be provided as frigates grew substantially in size, nor whether the limited number of oars imbued them with more than the most limited powers of manoeuvre.

Oar power needs to be regarded rather like the early days of steam propulsion, where the machinery was an auxiliary only – ships were faster under sail and indeed complex devices like hoisting screws were contrived to preserve sailing qualities; steam gave a tactical advantage when it was crucial (which usually meant in battle) but cruising was still done under canvas. Gradually the balance shifted, until steam became the dominant form of propulsion and masts and sails became secondary. To a certain extent, the reverse was true of oars as its importance declined over time.

In the late seventeenth century the Royal Navy built three 'galley-frigates' whose design and manning were optimised for rowing, intended mainly for operations in defence of Charles II's colony of Tangier and against so-called Barbary pirates in the Mediterranean. The oars required a specially enlarged crew, so in the 1690s when the war with France made seamen scarce, the Admiralty proposed reducing their crews on the grounds that they were now employed in the Channel where rowing was less useful. This implies that even galley-frigates did not expect to regularly operate under oars in areas of strong currents and heavier seas, an idea strengthened by the Navy Board's riposte emphasising the usefulness of oars in particular circumstances such as towing damaged ships in battle.



The design of the oar ports, or scuttles, remained essentially the same for the whole history of their employment, as demonstrated by this model of a Fifth Rate of the 1690s – the earliest known depiction of the feature. The lids were closed from forward with a horseshoe-shaped hinge, with a ringbolt on the inside for a lanyard to haul it shut. By the 1719 Establishment the ports were 8in high by 7½in fore and aft, and did not change much in size for their whole existence.

HHR14 US Naval Academy Museum, Annapolis, Maryland

SLR0411 One of the few models – a 1719 Establishment 20-gun ship – showing a frigate rigged for rowing. The oars scale out to about 36ft in length, and they were probably stowed with the spare spars and boats amidships when not in use. The internal geometry suggests three standing men could pull each oar, so of a total official complement of 140, 108 would be needed to man all the sweeps. It is probable that so-equipped the vessel could make 2 or 3 knots in slack water with no adverse wind, and there must have been enough tactical scenarios where this facility was useful to warrant its regular inclusion in the requirements for frigates and sloops.

Torrington's half-battery Fifth Rates of the 1690s implicitly accepted this argument as the lower deck equipped with sweep ports was an important criterion. This may well have determined the height between decks as the oarsmen stood to row so needed to be able to exert their full force without crouching. Single-deck ships of this period do not seem to have had dedicated sweep ports cut, but it is known that they could be rowed using the gunports, and an order of 1704 'allows' oars to all Fifth and Sixth Rates, as well as fireships and bombs. The wars of both William III and Queen Anne involved many inshore operations, where the ability to manoeuvre in confined but sheltered waters underlined the value of oar power.

Sweeps were large and cumbersome and in peacetime there was a strong incentive to leave them behind; indeed, the dockyards grew out of the habit of cutting scuttles for them. This was to be a repeating pattern down the century.

There was a revival of interest in 1718 when the first of the old half-battery ships were being converted into the new-style two-decked 20s; they were issued with ‘round-loomed ship oars’, and the requirement became established in 1719. Thereafter, all the Sixth Rates before 1745 invariably had eighteen oar scuttles a side on the lower deck, whether or not there were also gunports. In 1745 the oar ports were moved to the upper deck, but there are draughts showing scuttles on both decks, for a total of at least 60 oars (an impossible task for a crew of 160).

When his first 12pdr frigates were designed in 1756 Thomas Slade briefly toyed with the idea of working both cables and oars on the lower deck, but scuttles were never cut there and the cables were soon transferred to the upper deck as well. Most of the 28s and 32s of the Seven Years War were intended to be fitted for rowing, but this was clearly ignored in many cases. In June 1759 a general order was issued that all frigates and sloops with oar ports were to be supplied with oars; and those without were to have ‘as many ports as would prove useful’ cut between their gunports. After the end of this war in 1763, the old peacetime reluctance to ship oars seems to have reasserted itself, so in December 1775 it was necessary to instruct all frigates and sloops going to North America to carry their established number of oars – the war against the rebellious colonies was obviously going to be fought out in coastal waters and estuaries where an ability to manoeuvre independent of the wind would be useful. Nevertheless, in April 1781 it became necessary to order that all frigates (and sloops) building and repairing were to have oar ports cut.

SLR0476 As long as the lower deck of Sixth Rates was largely unarmed there was no difficulty making provision for rowing. In the run up to the new Establishment of 1745 consideration was given to moving the scuttles to the upper deck (and in some cases to open them up on both decks), but as shown by this model it was more difficult to contrive the usual eighteen as they competed for space with the main-battery gunports. Furthermore, as long as the channels were below the ports, their width and the shrouds they spread made it impossible to handle an oar from a port inboard of them. This is probably why the channels were moved above the upper deck ports in 1745, which in turn required the quarterdeck to be lengthened in order to give structural support to the main channels.

SLR0509 The essence of the so-called 'true frigate' was a gundeck (as the lower deck was still called) which was both reduced in height and lowered in the hull, so it was neither practical to cut scuttles so near the waterline nor to expect men to row in such cramped conditions. As this model of the 28-gun

Guadeloupe demonstrates, there was not room on the upper deck between gunports for anything like the previous eighteen a side in Sixth Rates, so this was a *de facto* admission that from here on the sweeps would be of strictly limited utility. Note the highly unusual top-hinged oar port lids.

SLR0317 This model of *Minerva,* one of the first 18pdr frigates, shows that even in the largest classes there was limited provision for sweeps. They are rarely depicted on later models, but this does not mean they were deleted from the requirements – one of the curious draughtsman's convention was that the oar scuttles were usually only shown on the framing plan and internal profile, not on the sheer draught. It is reasonable to assume that the rather austere Georgian style of official model only required a sheer draught, so the modelmaker would not represent a feature he could not see.

Draughts continue to show oar scuttles until almost the end of the Napoleonic Wars, but they are reduced to six or seven a side, which cannot have been intended for any greater purpose than manoeuvring the ship in a calm or when damaged aloft. Nevertheless, in 1801 the sizes of sweeps for frigates were laid down as: 38s – 60ft, 36s – 59ft, 32s – 50ft. Probably the last order relating to oars in frigates was issued in January 1813 instructing two scuttles to be cut in their counters, so that in an emergency a sweep might be used to turn the ship – this was derived from an analysis of the three defeats by American '44's in 1812, when it was thought such a provision would have allowed the dismasted British frigates to offer a broadside to the enemy.

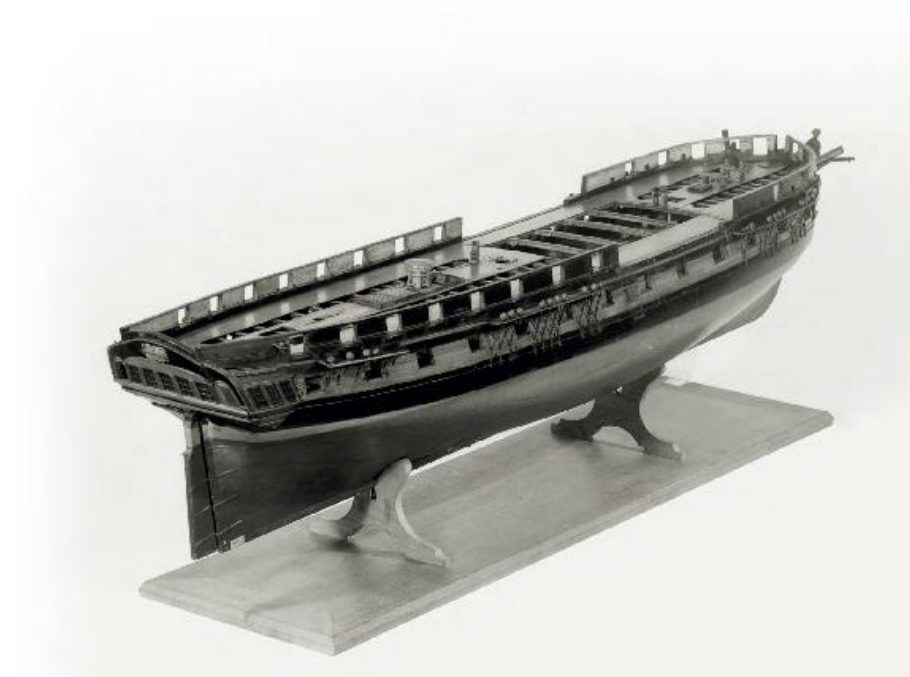
After 1815 the requirement for any form or oar power was quietly shelved. This may have been because Seppings's diagonal bracing between gunports was incompatible with cutting oar ports, but it more likely that it had simply outlived its usefulness. The next time the Royal Navy was involved in a major war – against Russia in 1853 – the auxiliary power was steam.

6: The Last Generation
1815-1850

The last act of the long struggle with the French empire was the unexpected, and very unwelcome, declaration of war on Britain by the United States of America. The infant US Navy was in no position to challenge the British head-on, so the war at sea quickly evolved the traditional character of commerce warfare countered by blockade. The length of the American coastline required an over-stretched Royal Navy to employ even more ships, and a large programme of frigate-building was put in hand. These ships were not expected to outlast what was hoped to be a short war, so were softwood ('fir-built') versions of the existing 38-gun *Leda* and 36-gun *Euryalus* designs. As the *Shannon–Chesapeake* engagement proved, British 18pdr frigates could deal with their exact equivalents, but the US Navy had a technological advantage in the three huge '44s' of the *Constitution* class. They were 'spar-decked', with what amounted to a flush upper deck, which when first built mounted guns along its complete length, including the waist. Not only could these ships carry well over 50 guns, but the main battery of thirty 24pdrs made them virtually invincible in action with anything calling itself a frigate. In the first year of the war this was painfully proved to a hitherto complacent Royal Navy when *Constitution* and *United States* beat three of the largest British 18pdr frigates in single-ship actions.

Although the British had built one or two 24pdr frigates in the 1790s, the few French ships of that description had been captured by 18pdr ships so there seemed to be no real need for over-size frigates. However, none of the French 24pdr frigates were in the same class as the American ships, and it was clear the Royal Navy needed something entirely new. Temporary measures included cutting down three 74-gun ships, building a number of softwood versions of *Endymion* (one of the only 24pdr designs available, although significantly smaller than the US ships), and eventually turning out two 'double-banked' ships, *Leander* and *Newcastle,* of similar size and firepower – although they were also fir-built and not expected to see extended service.

While fighting the War of 1812 with largely expendable ships, the Admiralty was simultaneously preparing for the post-war world, with a substantial programme of properly seasoned hardwood Dockyard-built ships that would last. The stunning successes of the US 44s woke Britain's enemies to the potential of such ships, so the Royal Navy would need 24pdr ships to counter French and Russian, as well as American, equivalents. This was an unwelcome escalation in size and cost, but there would never be more than a handful needed, so the main effort went into standard 38-gun frigates, which would become the smallest Fifth Rates (there would be no more 36s and 32s). However, no entirely new 18pdr frigate design was produced after the war, but the *Seringapatam* class, derived from a French hull form, needed significant modification to make their performance acceptable. All the new ships were completed with round sterns and the full panoply of Seppings' structural innovations.



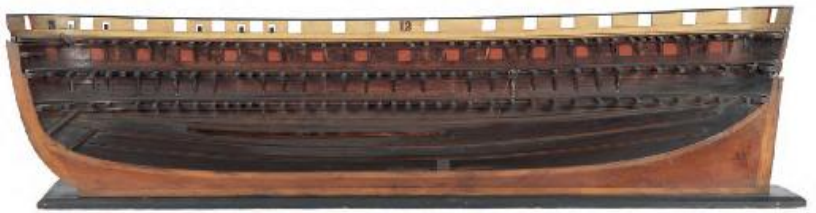
SLR0345 This model carries the name 'Pomona' on the stern and at 1/48th scale closely matches the captured French *Pomone* (a goddess usually rendered in English as Pomona). However, the model more accurately depicts the *Endymion*, built in 1797 to the lines of this French prize, as she was about 1813 after an extra (eighth) pair of gunports were cut in the quarterdeck bulwarks. It does not reflect the appearance of her French prototype, which never had so many gunports, nor the forecastle barricades or bridle port. As one of the few existing British 24pdr frigate designs available in 1812, *Endymion* became the emergency prototype of a class designed to meet the so-called '44s' of the US Navy; the new ships had one extra pair of gunports, but were still about 20 per cent smaller than their adversaries. Despite this discrepancy, in the only engagement of the War of 1812 between 24pdr frigates, the Endymion was instrumental in the defeat and capture of USS *President* in 1815.

SLR0795 Despite the presence of a few high-profile 24pdr ships, the majority of frigates on the Navy List were to remain 18pdr ships for fifteen years after 1815. The Admiralty was faced with the block obsolescence of large numbers of worn-out war-built ships while making do with parsimonious peacetime budgets. The answer was to construct a large number of ships in the Dockyards at a leisurely pace to allow the frames to be properly seasoned. They often spent many years on the stocks, roofed over to protect them against the weather – like the example on the *Unicorn* at Dundee – and even when launched, they were not always commissioned. They formed a strategic reserve, the idea being that in times of tension frigates could be fitted out in roughly the same time it would take to mobilise a crew. There were two designs, both derived from wartime classes but constructed on Seppings's principles. This model depicts one of the last of these, the Maeander, a modified version of the *Seringapatam*, which was ordered in 1824, spending eleven years on the stocks at Chatham, but not being actually commissioned until 1848. Although the hull form can be traced back ultimately to the 1790s, the post-war ships were characterised by a straightened sheer that raised the gunports amidships and gave the ships a less elegant but more purposeful profile.

One curious spin-off of the American war was the decision in 1817 to revise the rating system to list ships by their actual armament – during the war US propagandists had claimed their '44s' had beaten British ships of 48 guns (the real armament of many '38s' – and the Admiralty was determined to prevent such distortions in future. By this measure, spar-decked frigates became 60-gun ships and '38s' were listed as 46s.

As part of this revision, the remaining ship-sloops with a quarterdeck and forecastle were upgraded to Sixth Rates, which now included ships of between 24 and 28 guns. This group now filled a gap at the bottom end of the frigate spectrum, and significant numbers of 500- to 600-ton 28s were built from about 1816 onwards. According to the cynics, they were mainly intended to give the experience of command to young Post Captains who

could not be trusted with anything more valuable – derisively dubbed ‘donkey frigates’, these ships were closer in capabilities to the old sloop category.



SLR2306 The instant counter to the American frigates of the *Constitution* class were two rapidly built softwood ships, *Leander* and *Newcastle*, which were almost exactly the same size. They would not last long, so simultaneously the Surveyors set about designing a more considered response that could form the basis for post-war series construction. Typically, it was to be somewhat smaller – the minimum ship that could carry the required 60 guns – and this sectional model represents the resulting ship, the *Java*. Although ordered in 1813, she was never expected to take part in the war, being properly seasoned and not completed until 1826. She became the prototype of the eight-ship *Southampton* class ordered in the following decade. While the ship was building, experience with *Leander* and *Newcastle* suggested that guns in the waist were more of a hindrance than a help in action, as there was no room to both fight the guns and handle the sails, so the ship’s manoeuvrability was hampered. This echoed the experience of the Americans, who had removed the waist guns from their spar-decked frigates well before the War of 1812. Therefore, four of the waist ports on each side were removed and the barricades cut down before the ship completed, thereafter rating as a 52-gun ship. There were to be no more genuinely ‘double-banked’ frigates in the Royal Navy until the late 1840s.

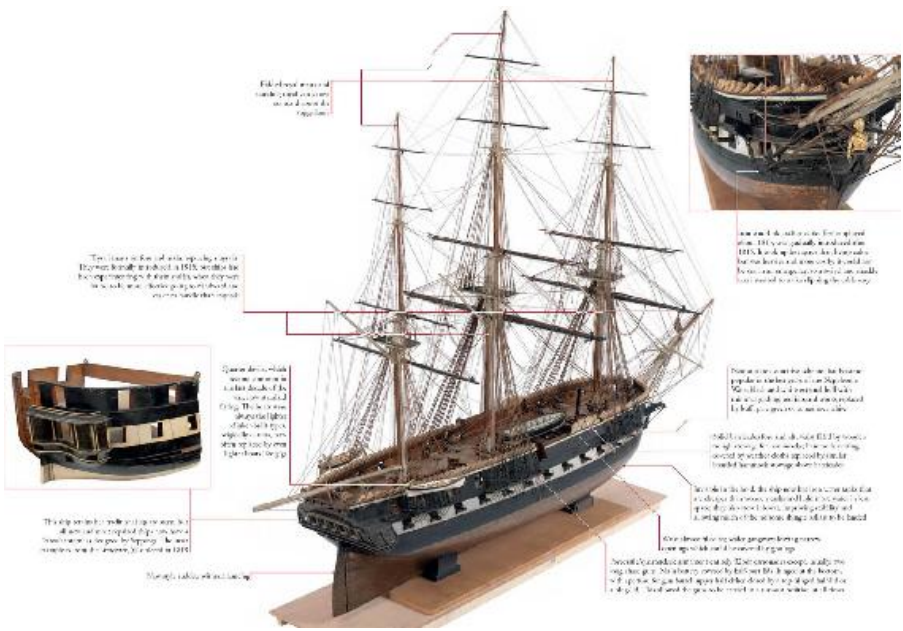
SLR0705 After 1817 the smallest ships regarded as frigates were Sixth Rates, most of which carried 28 guns. In layout terms, they had the usual upper deck main battery with a full quarterdeck and forecastle joined by waist gangways. This highly detailed model represents *Samarang*, one of the first post-war classes, of about 500 tons. The *Atholl* class was used to compare the durability of different timbers and this ship was built of teak at Cochin (now Kochi in India), enjoying one of the longest active careers. As the size of ships in each category escalated, their status as frigates became impossible to support and from the 1830s the survivors were cut down to 20-gun sloops. This model shows the ship after a rebuilding, probably in 1842, when the upperworks were made flush and the armament moved to the

upper deck. At this stage, the ship carried two long 9pdrs and eighteen short 32pdrs.

As a reflection of the strength and durability of the hull, the ship spent much of her long periods in commission on distant stations like South America, Cape of Good Hope and in the Far East. She was employed in surveying roles but also saw active service in the Opium Wars and against Malay pirates.

THE FRIGATE ABOUT 1825

This intriguing model depicts an old 36-gun frigate, probably of the *Phoebe* class (1795), but as refitted post-war when she would have rated as a 42-gun ship. *Phoebe* herself did survive the war and had garnered some recent fame by capturing USS *Essex* in 1814, but she was then reduced to harbour service. *Dryad* is a more likely candidate, having received a major repair at the end of the war – before the adoption of Seppings's 'circular stern' – and was actively employed in the late 1820s. The detail on this model is a highly convincing representation of how frigates looked around this time, and can only relate to a ship in active commission.



Controversy and Ship Design

Despite the successful outcome of the long naval wars and the generally satisfactory performance of British ships, after 1815 naval architecture became an arena for increasingly bitter battles, the ramifications of which

reached the highest levels of government. The wartime experience of much of the officer corps could be summarised as an endless struggle to bring a reluctant enemy to battle, so there was a growing belief that British ships, whatever their other qualities, should be faster. Although he was a superb engineer, Seppings was not very interested in hull form; he simply did not believe there was much improvement to be had from minor alterations to underwater lines. In this he was opposed by a number of naval officers, like Captain John Hayes and Admiral George Elliot, who fancied they could do better. The leading light among the amateurs was Commander William Symonds, who built a reputation for himself in the 1820s as a yacht designer for a group of influential aristocratic patrons. These 'yachts' were the size and form of small warships, and eventually the Admiralty agreed to allow an 18-gun brig, the *Columbine,* to be built to Symonds's design. His principal sponsor, the Hon George Vernon, put up a large surety to indemnify the Admiralty against the ship's failure, but when Symonds's star had risen so high that he was allowed to build a large frigate, he repaid the favour by getting the ship named *Vernon.*

Symonds espoused extremes – great breadth and very sharp hull lines – along with all the attention to stowage and the precise set-up of masts and rigging to be expected of a man who made his name in yacht racing. He was greatly aided in his campaign by the fact that in the 1820s the principle tool of comparison was the sailing trial, in which 'official' designs were tested against those of outsiders like Hayes and Symonds, as well as the apprentice efforts of the School of Naval Architecture. Symonds's ships usually showed up well, but he chose his captains carefully for their shiphandling skills, and was not averse to making changes during the trials if things were not going his way.

SLR0738 A model of the 50-gun Vernon, ordered to Symonds's design in 1831. A massive breakthrough in size, the ship is sometimes said to be based on the 'lines' of the 80-gun Gibraltar, a Spanish prize captured in 1780. Vernon's hull form, with its V-shaped midsection is entirely different and, strictly speaking, it is only the proportions of the Spanish ship that provided the starting point. Designed to carry a homogeneous armament of 32pdrs (twenty-eight 56cwt on the upper deck, twenty-two 45cwt on quarterdeck and forecastle), the ship followed the gun establishment of recently cut-down ('razeed') 74-gun ships, but was significantly more powerful than any previous purpose-built frigate.

Constructed very rapidly to prove a political point, the ship suffered structural defects and had to be rebuilt not once but twice. Note that the figurehead is a portrait not of the eighteenth-century admiral but of Symonds's patron, Lord Vernon.

In 1832 the reforming Whig administration abolished the Navy Board, forced Seppings to retire, and appointed Symonds the Surveyor in his place. This was an affront to the profession, and then and since Symonds' ships became the subject of partisan comment. Even Sir James Graham, who appointed him, said 'Except on matters of religion, I do not know of any difference of opinion which has been attended with so much bitterness – so much anger – so much resentment, as the merits of Sir W Symonds and the virtues of his ships.' They were undoubtedly faster, but that speed was bought at the expense of their seakeeping and, in particular, their steadiness. Their sharp section combined with a maximum beam that was above the waterline meant that as they rolled the displacement of the hull increased sharply, producing a 'bobbing' motion that would have been detrimental to their gunnery.

In truth, Symonds's great achievement – or that of his influential backers – was to break through the centuries-old reluctance to build ever-bigger ships. His designs were larger than those of Britain's likely enemies, which allowed them to combine the new heavier gun batteries with the power to out-sail their opponents – in fact, reversing the only real advantage possessed by French ships, that of greater size for any given weight of armament.

SLR0735 A model of the 26-gun Sixth Rate *Actaeon*, designed in 1827 by the School of Naval Architecture. Founded in response to the much-aired criticism that British shipbuilders lacked the 'scientific' training of their French counterparts, the School began to teach in 1811 and was intended to give a mathematical and theoretical grounding to the brightest of the shipwright apprentices. As part of the course, they were allowed to design and build one of these 'donkey frigates', beginning with the *Volage* in 1819 and followed by the *Sapphire* in 1825. The pupils of the School came to see themselves as an elite with very promising career prospects, a scenario that was to be blighted for many of them by the appointment from outside the dockyard hierarchy of the new Surveyor in 1832. Symonds had little respect for their knowledge, and even less belief in its efficacy; all he knew was that they took an age to design a ship and when it was eventually trialled it was usually out-sailed by a product of his seaman's experience. Not surprisingly, much of the opposition to his ideas and criticism of his ships came from within this group.

ROUND AND ELLIPTICAL STERNS

Towards the end of the war Seppings had persuaded the Admiralty to do away with the flat beakhead bulkhead on ships of the line, a source of weakness when attacking head-on, as had happened at Trafalgar. It was replaced by carrying the thick bow timbers up to the top of the forecastle, as was already the norm in frigates and smaller ships. After 1815 he turned his attention to the even more vulnerable stern, which above the wing transom

timber in the traditional form was little more than thin pilasters and glazing – so 'raking' shot fired from astern travelled unimpeded down the length of the gundecks, a tactic used at Trafalgar with devastating results. Seppings probably saw his proposal as part of a more general concern with the structural integrity of his ships, but the debate soon centred around its value in action.

SLR0315 The traditional stern gallery of a frigate offered little structural resistance. Above the level of the transom (where the hull planking ends) there was only a light framework and behind it lay the frigate's entire main battery. A good impression of the weakness of this structure can be gleaned from the unplanked model of *Winchelsea* shown on page 67. Not only were the guns and their crews rendered vulnerable to raking fire, but this system did not adequately protect the rudder head to which the tiller was fixed, so serious damage in this area would render the ship ungovernable. Therefore, it is not surprising that in battle captains probably feared being raked from astern more than any other tactic.

SLR2279 This pair of models demonstrates Seppings's initial ideas for a new-style stern in a two-decker (left) and a frigate. The red circles on the window-lights indicate that these were fitted up as gunports (enhanced astern fire made the design as much an improvement in active as passive defence). The timbering of the stern was radically revised, in effect carrying the square frames in a semi-circle around the stern, so it came to be known as a 'circular' or 'round' stern. The design was regarded as ugly by traditionalists (and there were many of these in both the Navy and Parliament), but also criticised by officers for omitting the quarter galleries, which housed their toilet facilities.

SLR2238 A model of the stern of the *Kent,* 74, one of the first ships to be fitted with a circular stern, in 1817. Although only painted on, the substantial scantling of the frames is apparent. There are a number of interesting features of this model: the ship originally had only a single 'roundhouse' protecting the rudderhead (as in the previous model), and the broken mouldings and glue residue look like it has been removed from the model; equally, those on the quarters may have been added as a proposed modification (the final pattern usually showed all three projections, with one restored to the centreline). The other oddity is that the model depicts a frigate: a number of 74s were cut down to make razeed frigates at this time, but *Kent* was not one of them, so this is probably just a demonstration of what might be done.

SLR2237 It was difficult criticise the improved strength of the circular stern, but its appearance continued to provoke negative comment – not least from the Duke of Clarence, Lord Admiral in 1827-8 and future King William IV, who absolutely detested it. Two senior shipwrights, Thomas Roberts and Richard Blake, worked on a more aesthetically pleasing form that retained the advantages of Seppings's design; this was eventually dubbed the 'elliptical' stern. This model of the frigate *Castor,* designed by Seppings but completed after he left office, shows an early version. There is also a comparative model [SLR2229] relating to this ship, which shows the standard Seppings pattern on the port side and the stern of the captured Danish frigate *Perlin* on the other. The latter featured the radical 'Hohlenberg stern', which was pinched in to provide some acute-angled fire on the quarters, but the model is clearly meant to demonstrate the superior all-round fire provided by Seppings's design.

5

SLR2230 The elliptical stern was enthusiastically embraced by Sir William Symonds, appointed Surveyor in 1832 to replace Seppings. In Symonds's hands the stern became even more traditional looking, this being the design for his big frigate *Vernon.* As in so many aspects of his naval architecture, Symonds liked extremes, eventually raking back the sterns of his ships so much that fire from stern-chasers threatened the fabric, while following seas were almost as damaging. The sterns of his battleships had to be rebuilt.

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SLK2243 The stern of the *Narcissus,* 50, one of the last sailing frigates ordered (in 1848), shows the mature design, with the outward appearance of an earlier century although disguising improved structural strength. Like so many sailing ships of this era, she was never completed, most being converted to steam screw propulsion or reordered as such to different designs. The tradition in the Navy was so deeply engrained that false stern lights and dummy quarter galleries continued to be a feature even of iron steam cruisers.

The Growth in Frigate Size 1815-1850

The largest regular frigates, 18pdr ships of a nominal 38 guns (or 40 in the French navy) had remained much the same size for thirty-five years from their inception around 1780 until the end of the wars in 1815. But in the thirty-five years following all frigate types grew substantially and rapidly. The process was kick-started by the realisation that US-style 24pdr ships of 1500 tons would have to replace 18pdr ships of 1000 as the ultimate cruisers, but even the smaller rates were subject to size and cost inflation. The new structural techniques pioneered by Seppings made larger ships feasible, but the real driving force was the desire to mount much heavier guns. At the end of the Napoleonic Wars there were many experiments with lightweight versions of long guns and by the mid-1820s it was possible to conceive of single-calibre armaments, even for ships of the line, with 32pdrs of different weights. The 32pdr was chosen as the largest shot that could be manhandled easily and rapidly in battle, and the idea was to carry very heavy guns on the lowest deck with progressively lighter (which also meant shorter) weapons on each deck above.

Fourth Rates

Name, gun rating	***President,* 44**
Date	1800
Gundeck length	173ft
Tons (bm)	1533
Main battery	30 – 24pdrs

The US Navy spar-decked frigate captured in 1815 set the parameters for the biggest frigates that followed

Name, gun rating	***Java,* 52**

Date	1815
Gundeck length	172ft
Tons (bm)	1449
Main battery	30 – 24pdrs

The prototype for the post-war spar-decked class

Name, gun rating	***Vernon,* 50**
Date	1831
Gundeck length	176ft
Tons (bm)	2082
Main battery	28 – 32pdrs

Symonds design for a frigate of the largest class

Name, gun rating	***Raleigh,* 50**
Date	1842
Gundeck length	180ft
Tons (bm)	1943
Main battery	28 – 32pdrs

Fincham design; a more conventional alternative to Symonds' hull form

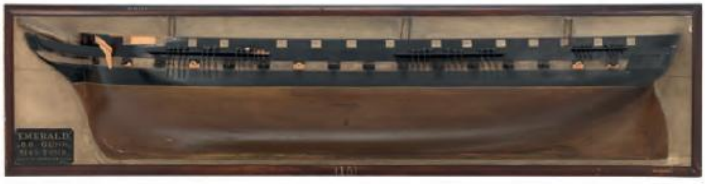
Name, gun rating	***Arethusa,* 50**
Date	1844
Gundeck length	180ft
Tons (bm)	2125
Main battery	28 – 32pdrs

An improved *Vernon;* sister *Constance* completed in 1846

Name, gun rating	***Nankin,* 50**
Date	1846
Gundeck length	185ft
Tons (bm)	2002
Main battery	22 – 32pdrs, 6 – 8in shell

Lang design

Name, gun rating	***Emerald,* 60**
Date	1848
Gundeck length	185ft
Tons (bm)	2146
Main battery	30 – 8in shell



Edye and Watts design; re-ordered as screw ship during construction

Name, gun rating	***San Fiorenzo,* 50**
Date	1849
Gundeck length	187ft
Tons (bm)	2065
Main battery	28 – 8in shell

Read, Chatfield & Creuze design; never completed

The first frigate designed for 32pdrs was Seppings's 36-gun *Castor* of 1828, in effect a replacement for the standard 18pdr 38, but it was the adoption of Symonds's principles that prompted a great leap in size. *Vernon* was well able to carry heavy (although not the heaviest) 32pdrs, even on the quarterdeck and forecastle, and her great breadth made it possible to fight the guns with ease. This ship clearly set the benchmark and frigates did not grow much in tonnage for the rest of the sailing era. By the mid-1830s even the smallest frigates were armed with 32pdrs.

This growth can be charted graphically through the collection of half models, once in the Models Room at Somerset House. Although it was founded by Seppings, it was greatly expanded by Symonds, which explains why his own work dominates the collection, but it does include some of the designs of his professional rivals.

Orders for new Fifth Rates were confined to Seppings's version of the *Leda* class until 1817. Thereafter, a modified *Seringapatam* known as the *Druid* class, took over, but when seven had been launched the design was again modified for the *Andromeda* class in 1827. Seppings's *Castor,* the first frigate designed for 32pdrs, was ordered in 1828, and in 1831-2 all incomplete 18pdr frigates were cancelled. Under the Symonds regime, his *Pique* class of seven ships (two were cancelled) became the standard medium frigate, with Hayes's *Inconstant* built for comparison. There was then a nine-year gap before the next, and final, Fifth Rate was ordered in 1842 as the *Thetis.*

Fifth Rates

Name, gun rating	***Shannon,* 38**
Date	1803
Gundeck length	150ft
Tons (bm)	1062
Main battery	28 – 18pdrs

This design continued to be built post-war as the smallest proper frigate, rated 46 guns from 1817; with Seppings's round stern they measured 152ft and 1077 tons

Name, gun rating	***Cambrian,* 36**
Date	1832
Gundeck length	160ft
Tons (bm)	1622
Main battery	18 – 32pdrs, 4 – 8in shell

Symonds design (*Pique* class) for a 32pdr-armed medium frigate

Name, gun rating	***Inconstant*, 36**
Date	1833
Gundeck length	160ft
Tons (bm)	1421
Main battery	18 – 32pdrs, 4 – 8in shell

Alternative to Symonds's design, by Captain John Hayes

Name, gun rating	***Thetis*, 36**
Date	1842
Gundeck length	165ft
Tons (bm)	1533
Main battery	18 – 32pdrs, 4 – 8in shell

Read, Chatfield & Creuze design, for the School of Naval Architecture

In the postwar years Sixth Rates were the vehicles for much experimentation, with a number of one-offs designed; even the numerous *Atholl* class were built of different timbers for comparative trials. Symonds, typically, introduced far larger vessels with his *Vestal* and the slightly modified *Spartan* classes, replacing a Seppings design for a 32pdr-armed ship, and once again the Admiralty allowed one alternative in the shape of Admiral George Elliot's *Eurydice.* Symonds's *Diamond* class of 1845 were the last sailing Sixth Rates ordered.

Sixth Rates

Name, gun rating	***Rainbow*, 28**
Date	1817
Gundeck length	114ft
Tons (bm)	500
Main battery	20 – 32pdr carronades

In 1817 surviving quarterdecked sloops were reclassed as Sixth Rates and new 28-gun ships like this *Athol* class were built; they were known derisively as 'donkey frigates'

Name, gun rating	***Spartan*, 26**
Date	1837
Gundeck length	131ft
Tons (bm)	911
Main battery	18 – 32pdr 42cwt medium guns

Symonds's design for small frigate

Name, gun rating	***Eurydice*, 26**
Date	1841
Gundeck length	141ft
Tons (bm)	911
Main battery	18 – 32pdr 45cwt medium guns

An alternative to Symonds's design, by Admiral George Elliot

Name, gun rating	***Diamond*, 28**
Date	1845
Gundeck length	140ft
Tons (bm)	1051
Main battery	20 – 32pdr 45cwt medium guns

Symonds's improved *Spartan* class

INSIDE A FRIGATE

This remarkable modern model, made by Edward Percy between 1970 and 1990, portrays the internal arrangements and structure of the 36-gun frigate *Pique* of 1834. Although this is a late example, the use of interior space did not alter radically in the century between the introduction of the so-called 'true frigate' and the end of sail, so this can stand as a representative view of the below-decks working of a frigate.

Quarterdeck and forecastle. Although this is now structurally one deck, conceptually the waist (the area without bulwarks) still separates the forecastle from the quarterdeck, which is the preserve of the officers.

1. Ship's wheel, just ahead of the mizzen mast
2. Skylights
3. Upper capstan
4. Ladderway
5. Main mast, with main jeer bitts abaft and main topsail sheet bitts forward of it
6. Main hatch
7. Fore hatch. The hatches mark the extremities of the waist, which was now planked flush with the decks fore and aft, apart from two narrow openings, running fore and aft to port and starboard which were usually covered with gratings
8. Funnel for the galley stove, with steam gratings before and abaft
9. Fore mast, with fore jeer bitts abaft and fore topsail sheet bitts forward of it
10. Scuttle

Upper deck. This was always the frigate's main battery deck, but also accommodated the captain aft.

11. Captain's quarters. This was divided into the Great Cabin across the full width of the stern, and forward of it (not depicted on the model) a fore-and-aft bulkhead dividing a bed place to starboard from a larger space traditionally known as the steerage or coach
12. Cabin bulkhead, separating off the captain's accommodation; it was removed when clearing for action
13. Skylights
14. Ladderway
15. Lower capstan
16. After hatch
17. Main mast partners, with bitts fore and aft. The chain pumps (not shown) were located around the main mast
18. Main hatch, with ladderway forward of it
19. Livestock pens
20. Fore hatch, with ladderway abaft
21. After riding bitts. The iron galley stove (not shown) was fitted ahead of them, between the supporting standards
22. Fore mast partners
23. Fore riding bitts, with scuttle between the supporting standards
24. Bowsprit step
25. Manger. As its name suggests, it may once have housed animals but by this date was simply an area bounded by a low bulkhead designed to prevent excess water that might enter through the anchor hawse holes from flooding the deck

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Lower deck. From the time of the 'true frigate' onwards, this deck carried no guns but it was still known as the gundeck until the early nineteenth century. This complete unarmed deck was unique to the frigate, where the crew berthed in drier and more spacious conditions than found on a line of battle ship.

26. Rudder head, tiller and quadrant. Note the run of the tiller ropes across the deckhead, just forward of the cabin bulkhead and up to the wheel
27. Mizzen mast step. Unlike the two larger masts, which stepped on the keel, the mizzen stepped on the lower deck
28. Wardroom, the senior officers' accommodation
29. The cabins were allocated on the port side, from aft, to the chaplain, purser, 3rd lieutenant, master; they faced on the starboard side the cabins of the surgeon, 4th, 2nd and 1st lieutenants. Because this deck need not be cleared for action, the cabin partitions were permanent
30. Wardroom bulkhead, with doors port and starboard
31. Ladderway down to after platform
32. Forward of the wardroom bulkhead were, on the port side, cabins for the 1st lieutenant of Marines, captain's clerk, boatswain, and a larger one for all the midshipmen; opposite were cabins for the 2nd lieutenant of Marines, gunner, carpenter, captain's steward, and a larger one for the mates and assistant surgeon
33. Bitt pins. Bag racks for the crew were set up between the pins of the riding bitts forward
34. Hatchways

Orlop deck. In frigates this was not continuous, the fore and after platforms being separate from the orlop proper amidships. The platforms housed store rooms which needed frequent access, so this arrangement allowed more headroom to be worked in – over 7ft in this ship compared with only 5ft for the orlop.

35. Stanchion to mizzen mast step
36. After platform. Although the model does not show the partitions, this deck was devoted to the 'domestic' side of running the ship, including the captain's and lieutenants' store rooms, the steward's room, slop (spare clothing) room and Marine clothing store. There were secure hatches to the spirit

room, fish room and after magazine below
37. Orlop. The main use for this platform was as the cable tier – the anchor cable was brought down through the main hatch and coiled around full-height stanchions arrayed in a rectangular formation around most of the forward end of the orlop
38. Fore platform. This deck was for 'ship' stores – the boatswain's, carpenter' and gunner's stores, the sail room and pitch room. There was usually also a passageway to the magazine below, and a scuttle to the fore peak

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Hold. This referred to the level below the orlop; it was not a single open space but was itself sub-divided.

39. Bread room
40. Magazine
41. Light room
42. Fish room and spirit room
43. After hold. Iron ballast formed the lowest layer of the stowage with water and 'wet' provisions (preserved foodstuffs) in casks above. By this date water was stowed in iron tanks, reducing the need for shingle ballast (to bed down the casks)
44. Main mast step. Around it is a chamber forming the pump well (where bilge water collected to be removed by the pumps) and fore and aft of that were shot lockers
45. Below the orlop was the main hold, which was separated from the ship's side by wing passages – often called the carpenter's walk because it allowed this officer to inspect the outer hull without moving anything stowed in the hold. This model shows the inboard partitions of this space
46. Fore hold
47. Frigates normally had two magazines, the forward (and main) one occupying this space under the fore platform. However, this model follows the original draught, which does not show one.
48. Fore mast step
49. Fore peak

The Last Sailing Frigates

Because the appointment of Symonds had been overtly party-political, it was not surprising that a change of government in 1841 undermined the Surveyor's authority, reviving criticism from his professional enemies. Rightly, the controversy had concentrated on the battleships, the arbiters of naval power; but, in any case, after *Vernon* there had been no more big frigates for a decade, development being concentrated on the more economical 32pdr 36-gun class, typified by Symonds's *Pique.* However, in the early 1840s a number of 50-gun ships were ordered in clear competition with the Surveyor's work – *Raleigh* to a John Fincham design, *Leander* by Richard Blake, *Phaeton* by Joseph White, *Indefatigable* by William Edye and *Nankin* by Oliver W Lang; for comparison Symonds produced an improved *Vernon* as the *Constance.* They were all around 2000 tons, although (as usual) Symonds contrived to make his ship the largest. They were intensively tested in sailing trials among the frigates, and against line of battle ships – because their hulls were so big they behaved much like battleships, so the real agenda was probably to discover, relatively cheaply, if any of them offered advantages over Symonds's capital ship designs. The results of the trials, as

ever, were open to partisan interpretation, and it is now recognised that virtually no data of real value to naval architecture was ever gleaned by these methods.

These were not the very last sailing frigates ordered, three new designs being drawn up as late as 1848, but they were among the last to be completed as such. While the attention of Symonds and his rivals was fixated on performance under sail, a new technology was steadily advancing, one which would eventually render sailing qualities an irrelevance. Steam propulsion, as long as it was confined to paddle wheels, would never be a threat to major warships: the paddle boxes took the place of too many broadside guns, and the paddles themselves were extremely exposed in close action. But the screw propeller was a different matter: not only was there no interruption of the gun batteries, but the machinery was below the waterline and even less vulnerable than masts and sails. Once its viability had been proved, the propeller was adopted rapidly and enthusiastically by the Admiralty, and in 1844 both a prototype conversion (*Amphion,* then still on the stocks) and the first new-build screw frigate (*Arrogant*) were ordered. Within a few years all of the sailing frigates on order had been cancelled and many reordered as steam frigates to new designs; those building were completed as steamers, and even many of the recently completed ships were eventually converted to steam.

SLR0841 The last of six big frigates ordered 1842-46 to competing draughts, *Nankin* was designed by Oliver W Lang, a protégé of Seppings and one of the most outspoken critics of Symonds. The ship was the last new sailing frigate to commission, and unlike most of her classmates she was never converted to screw propulsion.

Two 50-gun ships brought the era to a close: *Nankin,* commissioned in 1855 after nine years building, was the last sailing frigate to enter service, and the *Severn,* sent down the ways the following year, was the last purely sailing warship launched for the Royal Navy, but even she was eventually completed as a steamer.

SLR0908 The last sailing frigates ordered were eight big Fourth Rates to four different designs (in 1848, although two more were added in 1850), one of which was cancelled and the remainder reordered as screw frigates. The largest was the 60-gun *Emerald* class by Watts and Edye, the first genuine 'double-banked' frigates with guns in the waist since 1815. In the event, all four were built to a revised, greatly lengthened design, as demonstrated by this model of *Immortalite.* The new armament was to be thirty 8in shell guns on what was now called the main deck, and twenty 32pdr 56cwt guns on the upper deck, plus one 68pdr 95cwt gun on a pivot mounting (seen aft on the centreline). At 251ft on the deck, this ship was 14ft longer than her sisters, and she enjoyed a reputation as the fastest wooden screw ship under sail, logging over 12kts – which was roughly the same as she achieved under steam on her trials.

SLR2373 While steam was important for the tactical advantage it bestowed in action, sailing cruisers were still expected to make passages under sail, so speed under canvas remained a desirable asset. Unfortunately, propeller drag turned out to be such a significant hindrance that much ingenuity was expended on ways of alleviating or even removing the problem altogether. De-clutching the propeller shaft and letting the screw freewheel in the wake was tried, but the most widespread approach was the device demonstrated by this model of a frigate's stern – the lifting screw. Propellers were two-bladed, so could be turned vertical in what was called a banjo frame and then hoisted into a watertight well inside the ship's stern. It still left a big gap in the lines of the stern, but it was better than the drag of a non-revolving propeller.

Postscript

The frigate entered the navy at a time of rapid technological and tactical change, with a resulting confusion in both terminology and function. In the mid-seventeenth century the notion of a frigate was transformed from an ultra-light raiding craft into the 'great frigate' that was really the ancestor of the line of battle ship, but gradually the term became confined to cruising ships not intended to fight in fleet encounters: battleships and frigates thereafter had distinct roles that were clearly defined and understood.

Some of the earlier uncertainty returned in the mid-nineteenth century, and for similar reasons. The old rating system based on the number of guns carried became a less accurate indication of firepower as ships began to mount fewer but far heavier guns, while steam propulsion added a further complication to the traditional descriptions of ships. In this evolving new world, some concepts survived: frigates continued to be defined as ships with a single covered battery, even though they now had a complete second deck above. Therefore, when the iron-hulled armour-clad *Warrior* was launched in 1861 she was rated as a frigate, despite being the most powerful ship in the fleet – a 'black snake among the rabbits' as she was famously described. The ship was a radical fusion of many existing technologies, none of which was entirely novel, but the end-result was a naval revolution that has led some historians to hail the ship as the world's first modern battleship. It is unlikely that she was ever intended for a conventional role in the line of battle but, repeating seventeenth-century history, this 'frigate' was to develop into a series of broadside ironclads that were the battleships of the day. In this respect, the history of the frigate came full circle.

SLR0085 As the world's first iron-hulled armour-clad *Warrior* was revolutionary in many ways but, as this small-scale (1/192, or 1/16th of an inch to the foot) but contemporary model shows, there was much in the general single-decked layout and traditional head and stern that harked back to her frigate predecessors.

Further Reading

The Ships

The early history of the frigate is not well covered in print. The best account is an academic article by A D Thrush, 'In Pursuit of the Frigate, 1603-40', in *Historical Research* LXIV (1991), pp29-45. In many ways the Establishment era is even more poorly served, but a start was made by R C Anderson in 'The Ancestry of the Eighteenth-Century Frigate', in *The Mariner's Mirror* XXVII (1941), pp158-165; the article documents many of the anomalies and exceptions among the Sixth Rates, but does not attempt to resolve any of the issues raised. From the introduction of the 'true frigate' their design history is covered in detail by this author in a chronological sequence of three books: *The First Frigates: Nine-pounder and Twelve-pounder Frigates 1748-1815,* Conway Maritime Press, London 1992; *The Heavy Frigate: Eighteen-pounder Frigates 1778-1800,* Conway Maritime Press, London 1994; and *Frigates of the Napoleonic Wars,* Chatham Publishing 2000 (and paperback edition 2006). This last carries the story to the end of the 18pdr frigate around 1830, but there is no equivalent volume for the last generation of sailing frigates. For the best coverage of the Symondite controversy, readers are directed to Andrew Lambert, *The Last Sailing Battlefleet,* Conway Maritime Press, London 1991; despite its title, it has much that is relevant to frigate design.

In-depth studies of individual frigates include three in the 'Anatomy of the Ship' series published by Conway Maritime Press: *The Frigate Diana* [a 38-gun ship of 1793] by David White (1987); *The 20-Gun Ship Blandford* [1719 Establishment] by Peter Goodwin (1988); and *The 24-Gun Frigate Pandora 1779* by John McKay and Ron Coleman (1992).

Models

In order to be useful as historical evidence ship models have to be firmly identified – by date and type if not by name – and this has always been problematical. The first systematic attempts to identify scale ship models can be credited to members of the Society for Nautical Research in the early years of its existence. Foremost among them was Dr R C Anderson, who published numerous articles and notes in the pages of *The Mariner's Mirror.* His work on the Greenwich collection still forms the basis of the National Maritime Museum's descriptions of its models and, despite its age, Anderson's *Catalogue of Ship-Models* (Her Majesty's Stationery Office, London 1952) remains valuable for explaining on a model-by-model basis the evidence for his identifications. An important breakthrough in the understanding of 'official' ship models came with the publication of John Franklin's *Navy Board Ship Models 1650-1750* (Conway Maritime Press, London 1989),

which among many other insights showed how modelmakers could easily employ 'odd' scales – since it had been widely assumed that models were either 1/48th or some obvious multiple thereof, this cast doubt on some previous identifications but opened the way for many others. The book was a master-class in the profound analysis of selected Navy Board models, including a number of early frigates from Greenwich, the Pitt Rivers Museum at Oxford, and the Kriegstein Collection.

Since then the study of historical ship models has burgeoned, and much more is now known about the circumstances in which they were produced and the men who made them. The best general survey is Brian Lavery & Simon Stephens, *Ship Models: Their Purpose and Development from 1650 to the Present* (Zwemmer, London 1995). Written by two of the National Maritime Museum's senior curators, it showcases the Greenwich collection but also provides a broader context to the history of ship modelling. Outside Greenwich, the best (if not the largest) public collection of official ship models is that of Henry Huddleston Rogers at the US Naval Academy Museum in Annapolis, MD, whose gems include the unique *demi-batterie* Fifth Rate featured on pages 12-13. The original catalogue of this collection, although well illustrated, lacked academic rigour in its descriptions, but a new study by the historian of the Rogers collection, Major Grant Walker, represents a huge step forward. To be published in two volumes, the first due in 2013, it promises one of the most thorough and sophisticated investigations of individual models ever carried out.

A few important frigate models from elsewhere have been reproduced in published catalogues: what is probably the *Nightingale* of 1702 in Simon Stephens' *Ship Models: The Thomson Collection at the Art Gallery of Ontario* (Skylet Publishing/Art Gallery of Ontario 2009); while the most discriminating of private collectors, Arnold and Henry Kriegstein, include two early Fifth Rates in their superbly produced *17th and 18th Century Ship Models from the Kriegstein Collection* (Pier Books/Dupont Communications, Piermont, NY and Florence, OR 2007).